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THE PRACTICAL TEACHER

THE REV. T. W. SHARPE.

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THE
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A MONTHLY MAGAZINE AND REVIEW
FOR THE SCHOOL-ROOM AND THE STUDY

VOL. XVIII. No. 11. MAY, 1898. PRICE, 6D. POST FREE, 8D.

THE UNION OF PRACTICAL TEACHERS AT CHELTENHAM.

THE TWENTY-NINTH ANNUAL CONFERENCE OF THE NATIONAL UNION OF TEACHERS, HELD DURING EASTER WEEK.

I.—MR. R. WADDINGTON'S PRESIDENTIAL ADDRESS.

CUSTOM requires that the President of the N.U.T. shall talk himself into office on the afternoon of *his* particular Easter Monday. Accordingly the assembled delegates listened to the deliverance of Mr. Waddington's thoughts and suggestions on matters educational as the first chief item of their Cheltenham bill of fare. It was easy to guess that the Half-Time champion would have his fling at the cruel half-time system, and that the voluntary teacher-President would declaim, and justly so, against the unfair treatment meted out to his self-denying and inadequately appreciated fellows, and, indeed, it was upon these two strings that Mr. Waddington played. It must have been a great disappointment to him to have been compelled by considerations of policy to omit all mention of the most burning of all present-day questions, viz., Superannuation, but the fiat had gone forth, and the President yielded implicit obedience thereto, hence no reference—good, bad or indifferent—to the Pension question throughout the whole of the address.

The New President pleads 'for the removal of the proper education of the child from the arena of dogma, doctrine, or party politics.'

Dogma, Doctrine, and Party Politics.—'I plead for the removal of the proper education of the child from the arena of dogma, doctrine or party politics,' was Mr. Waddington's text. He might have added, 'and for the speedy and complete abolition of the Half-Time system,' but this was understood.

In 1870 the State took upon itself the responsibility of securing

A SCHOOL PLACE FOR EVERY CHILD.

Denominations, with commendable zeal, had prior to 1870 supplied the not very exacting educational needs of the nation. When other helpers failed, a school board was to be created to supply the deficient school accommodation. The dual system thus created consists to-day of Board and Voluntary schools working side by side for the education of the people. The State provides that the Board Schools, when created, shall be maintained by Imperial grants and local rates, and that the Voluntary schools shall exist on Imperial aid and local charity in the form of voluntary contributions. How long is the education of the English boy and girl to be subject to the fitful generosity of the benevolent, while the superior education of the German and the Swiss is undermining our commercial and industrial supremacy in the markets of the world? The State teacher engaged in the high calling of the education of the children maintained by free-will offering is an anachronism too glaring to continue. While all are taxed for the Imperial grant, the local rate is only in force over two-thirds of the area of the country. The West Ham inhabitant pays an educational rate approaching half-a-crown in the pound, while Preston escapes a local educational rate on the plea of excessive love for dogmatic teaching.

The Eastbourne patent method of keeping out the School Board by a five per cent. Limited Liability Company next came in for a good deal of scathing notice, leading up to the prophecy that **'the Company must finally meet the Official Receiver,'** unless the good folk of the Duke of Devonshire's beautiful seaside town are prepared to pay the dividend by subscription. Taking his own Bolton as an exemplar, the President went on to show that the new way of dodging the School Board was a most uneconomical one.

> Take the town of Bolton as an illustration. The Bolton School Board has built schools at a cost of £168,727, borrowing the money on loan for a period of fifty years. The amount repaid for principal and interest decreases each year, until at the end of fifty years the debt is cleared, and the schools are the property of the people. The amount paid in repayment of principal and interest for 1897 was £7,477. Had these schools been built by the Eastbourne Company, and five per cent. charged, the amount would have been not £7,477, but £8,436. Bolton would pay £1,000 a year more during this year, and this would increase, until fifty years hence the town would be saddled with a perpetual charge of £8,436, whereas under the present arrangement the charge will have disappeared and the schools will be the property of the locality.

The great monetary sacrifice of the voluntary teacher,

whereby salaries in the non-board school were 10s. 2¾d. less per head than in the Board schools was next referred to, only to be condemned by the assembled delegates, as indeed it richly deserved.

This gave point to the non-election of teachers upon the Federations, to which Mr. Waddington did not fail to refer.

> This is a fact that appears to have been forgotten by the heads of the Church of England, more especially in their callous and curt refusal to accept the teachers on the Governing Bodies of the Associations of Schools created under the Act of 1897. Why the heads of the Church should have shown such zeal in excluding the largest voluntary contributors—the teachers—by arts and devices worthy of a better cause, is an enigma capable only of being solved by a knowledge of the procedure of these nebulous bodies of 'fluid' origin.

The Staff.—'A certificated teacher for every **115** scholars in the Voluntary Schools and one for every **eighty** scholars in the Board Schools,' needed but statement to be howled against, and strong as was the language of the President, it was warranted by the figures that he quoted.

> Benevolence in education has become an excuse for limiting the education of the people. Looked at from every standpoint,
>
> THE THEOLOGIAN BLOCKS THE WAY.
>
> Pupil teachers cannot be adequately trained because they are the mainstay of the Voluntary schools. We cannot supply an adult teacher for every forty scholars because of the poverty of the Voluntary schools. The assistant teachers cannot be properly remunerated because their proper payment spells ruin to the schools that trust to subscriptions from subscribers who do not fall into ecstacies when subscribing. The students trained in denominational training colleges rarely return to denominational schools. And can you wonder, when last year of 4,674 certificated assistant masters in Board schools, 3,032 received over £100 a year; while of the 2,032 in Voluntary schools only 199 received that amount? Of the women teachers in Board schools 6,078 out of 11,426 received more than £75 a year, while of the 6,861 in Voluntary schools only 316 received a like remuneration. The Board schools are too often understaffed and the teachers by no means adequately paid. The large body of 4,674 assistant masters in the Board schools, and the 2,032 in the Voluntary schools must remain assistants in perpetuity, and the vast majority of them receive a wage smaller than the skilled artisans in the factory and the workshop. And any attempt to give them a reasonable remuneration in keeping with their calling is met with the cry of extravagance or cruel competition with the Voluntary schools. I recognise no cruelty in competition that makes for the better education of the people. With eighty scholars to each certificated teacher the Board schools can never equal the schools of our continental rivals, where there is a teacher for every forty scholars.
>
> Even in England, and that, too, in the primary schools, the specialist who teaches one instead of twenty subjects is limited to twenty scholars. But what of the Voluntary schools with
>
> 115 SCHOLARS TO EACH CERTIFICATED TEACHER?
>
> Need we go roving the continent to discover why we are beaten in the commercial competition? The answer comes unerringly and repeatedly 'German supremacy is made in the schools of Germany.' The buildings and appliances of the Voluntary schools are too often out of date; Clause 25 of the Education Bill of 1896 provided for the borrowing of money for the improvement of the fabric, but the Act of 1897 leaves the buildings
>
> TO THE TENDER MERCY OF A BAZAAR, CONCERT, OR PAROCHIAL TEA-PARTY,
>
> and, failing these, the too small salary of the teacher.

A million and a half wanted: £620,000 granted.

To bring the income of the Voluntary schools up to that of the Board schools, even maintaining the present voluntary contributions, requires a sum of 1½ millions. The Voluntary Schools' Act (1897) provided £620,000 toward this amount. And the heads of the denominations, especially those of the Church of England, might note that the teachers in Voluntary schools make an annual contribution of 1½ millions in the shape of smaller salaries. Until last year this sacrifice was borne, if not cheerfully at least hopefully, because it was felt to be fully recognised by the heads of the various churches that the first desire in seeking increased aid was the financial requital of the sacrifice of the teachers.

The creation of the Governing Bodies of the Associations of Schools under the Voluntary Schools' Act of 1897 has brought a rude awakening. The Voluntary school teacher is a very good fellow as organist, Sunday school superintendent, clothing club secretary, or general parochial drudge, but he is not of the elect when it comes to the formation of Governing Bodies, as may be gathered from the following table partly compiled by *The Schoolmaster*:—

Federations.	Number of Members of Governing Bodies.	Number of Teacher Members	Percentage of Teachers	Average Salary of Head Master.
Wesleyan Schools - -	245	45	18	£172
British and other Schools -	205	26	12	£143
Roman Catholic Schools -	48	5	10	£117
Church of England Schools	980	26	2	£121

Whether the teacher knows too much or too little is not disclosed; but this table amply proves that, even in the church or chapel the Englishman values most what he pays most for. The professional zeal and loyal churchmanship of the Voluntary school teacher have made the Voluntary school possible to-day, and the gratitude of the heads of the Church is a denial of the proffered co-operation in strengthening the schools, in terms that have taken the heart out of the mass of Church school teachers, at least.

Retribution.—As a result of this continued flouting of the voluntary teacher by the voluntary manager, we have, said the speaker, the disgust of the teacher leading to an increasing disinclination on his part to accept service that is so scurvily requited.

Dogma and Doctrine are not essential to the education of a child.

> The fine shades of dogma, and the finer shades of doctrine that divide Christians into 250 sects, are not essential to a child's education. The parents are not keenly anxious on the matter. The *bonâ fide* parent claiming the inalienable right is as difficult to discover as the 'meaning of a place within the Act.' The parent is anxious that his offspring shall be taught 'to keep God's holy will and commandments, and walk in the same all the days of his life.'
>
> And for children between five and thirteen years of age, surely that is a task sufficiently difficult of attainment.

The remedy is, that the clergy should take in hand the teaching of their particular churches, which would clear the ground and make possible the shifting of the burden of popular education **from local to Imperial shoulders**: the opinion of the Duke of Devonshire was put forward by the President in support of the contention that education is 'not merely a local work.' It is something more; it is national work.

The Grant and its failings then came in for criticism. The 'prize-packet system' of separate doles for separate subjects should give place to a fixed grant in aid, which should not be smaller, claimed the speaker, in the case of infants' schools as compared with those for elder children. Small schools should be paid at a higher rate, and inefficiency should be met first of all by an increased grant in order that lack of efficiency should not be due to lack of funds. Then it would be just to close the inefficient school, which is not the case now.

Injustice to the Rurals.—

> Yet we hear that the rural schools do not need the full five shilling Grant under the Voluntary Schools' Act (1897), and that, in order that the urban school may have 5s. 9d., the country school must be content with 3s. 3d. per scholar. The arrangement passes comprehension, especially after the statement of Sir John Gorst at Cardiff, where he said, 'Education was more wanted in rural districts than even in towns.'

The Grant should be payable in Advance.—

> The present method of paying the grant two or three months after the close of the year either enriches the banker or

BRITISH MUSEUM

impoverishes the teacher. It too often results in a large portion of the small salary of the teacher being held over until the arrival of the grant. The Education Department evidently agrees that it is wise to 'hasten slowly' in the matter of signing cheques, with the result that the grant rarely arrives before, and often after, the day of expectation. Surely a proper system would at least provide for the quarterly payment of the money. How much this would mean to managers and teachers, I fear the Education Department hardly recognises.

A NATIONAL SYSTEM OF EDUCATION,

fully and adequately maintained by the State, is the only solution of our present educational difficulties.

Then came Mr. Waddington's *pièce de résistance*, namely, his philippic against the discredited Half-Time System. After a gibe at the **'pious and delusive incumbrance of the Statute Book'**—to wit, the Act of 1876, which decreed that the parent must secure the attendance at school of every child between the ages of five and fourteen years—Mr. Waddington proceeded to poke fun at the bye-laws that override the Act.

> In 70 per cent. of the school districts a child is totally exempt from school attendance at eleven on passing the fourth standard. At eleven, on passing the total exemption standard, which is generally the fourth, a child may be a
>
> Butcher but not a Baker,
> Shopkeeper but not a Tailor,
> Furniture Broker but not a Cabinet-maker,
> Book-keeper but not a Book-binder,
> Newspaper-seller but not a Newspaper-folder,
> Teacher but not a Blacksmith.
>
> And a year later, at twelve, a boy may work full time underground as a miner, while he cannot be employed picking coal above ground until one or two years later. In fact, he is an unlucky wight who cannot find some legal form of exemption as soon as he reaches his eleventh birthday.

Then step by step the speaker met and refuted the arguments passing current in support of this diabolic enslavement of the little child. (1) **It is necessary manual training.**—Against this the President pitted Messrs. Harwood and Houldsworth, M.P.s, specialists both, who agree that the requisite manual skill can be picked up easily and effectually by children of thirteen in a very short time. (2) **Is it the need or the greed of the parent?**—Mr. Waddington showed conclusively that it is the greed of the operative, who exploits his eleven-year-old bairn in order that his creature comforts may be thereby increased. The **widow theory**, which pictures the half-timer living laborious days in order to keep his widowed mother from the workhouse, does not hold water, else, said Mr. Waddington, Lancashire and Yorkshire must have a practical monopoly of the indigent widow. (3) **Is it healthy?**—This was soon disposed of by the President. 'The while the Burnley and Blackburn operatives are continually on strike because of the atmospheric condition of the mills,' how can **'the death trap for the adult** be the **sanitorium of the child?'** The testimony of the factory inspector tells dead against the system. But gravest of all is the social indictment.

The Social Aspect.—

> But there is a social aspect of the question too little considered. The surroundings of the factory and the workshop are not the most conducive to the moral training of young children. I make no suggestion of loose morality among the large body of factory operatives. The best woman I ever knew was a factory operative. In good homes it requires the watchful care of the parent to keep from childhood knowledge which is only dangerous when premature. The parental influence is generally absent when the child is at work. The child adopts the ways, aye, and sayings of adults. The pleasing childishness that one hopes will linger disappears. The influence of the teacher has to contend with the influence of the mill. Parental authority is exerted with diffidence, and 'the almighty dollar' makes the child master when it were better the child should be mastered. Little wonder the parents plead, 'If he doesn't go to work at eleven, he'll be getting married before I get any benefit from him.' On educational grounds the system stands condemned. Our Technical schools and our Evening Continuation schools can only be effective if a proper foundation is laid in the day school. Child labour prevents this.

THE SYSTEM IS BAD, BARBAROUS, AND OBSOLETE.

> It is unnecessary. The only shred of defence is the supposed poverty of its clients. We are told how the half-a-crown of the half-timer keeps the wolf from the door when the bread winner is taken. If the half-time system were confined to the children of poor widows there would be no need for legislation. If there is one iota of truth in the contention, widowhood must be the normal parental state in Lancashire and Yorkshire.'

(4) **The Argument for Self**—'It was good enough for me, and therefore is good enough for my child.' This Mr. Waddington held up to opprobrium, as was meet; and then he went on to lament that Sir John Gorst's pledge at Berlin in 1890 that twelve years should be the limit of half-time employment should remain unfulfilled, thus putting England on a level with Turkey, Italy, and Spain.

The Duty of the Nation was made clear in the following words:—

> It is the nation's duty as well as its privilege to defend the children by raising the age for employment to thirteen years, and abolishing the obsolete and barbarous half-time system. Below fourteen the qualification for exemption in addition to thirteen years of age should be a certificate of regular attendance at school between the ages of five and thirteen. In the interest of regularity of attendance at school, the full fruition of the more educational ideals of the new Code, and uniformity of exemption, regularity of attendance should be the additional qualification for exemption before fourteen years of age.

The Peroration.—

> In conclusion I venture to urge the enforcement of the Education Acts of 1870 and 1876 by securing a school place for every child and every child in its place.
>
> To rationalise, synchronise, and popularise our School system is a task worthy of the highest art of Statecraft. The Shibboleths of fanatics in politics, religion, or industry must no longer prevent the realisation of the State's duty to the child. The religious difficulty is non-existent in the schools. The lack of apparatus, sanitation, teaching power, and proper accommodation, together with lax enforcement of compulsion, are aids to ignorance really in existence. The influence of the Schoolmaster has passed the region of controversy. Whether judged by criminal statistics, social influence, or the general improvement of the democracy, there is ample evidence that, in spite of chaotic laws, local indifference, and financial difficulties, the work of the schools shows a record that commands more generous treatment at the hand of the Legislature. The future of our country is in the hands of her people. Democracy is omnipotent. In the education of the people let us agree that
>
> 'For modes of faith let graceless zealots fight;
> His can't be wrong whose life is in the right.'

II.—THE PRACTICAL TEACHER AS DELEGATE.

FOLLOWING the route as well as the advice of that latest addition to the PRACTICAL TEACHER staff—to wit, the Cycling Editor—the PRACTICAL TEACHER'S Note-Taker hied himself to Cheltenham, which town of beauty and hospitality he reached somewhere about noon on Easter-Monday. As to the journey down, he found all things in accord with the cycling article, but one thing—and that a most important one—the writer had omitted to arrange for, and that was the weather, or, to be more precise, the wind, which seems to have a spite against the 'bike' of your Note-Taker, and would only permit progress after most unpleasantly increased exertion. However, the prettiness of the country, especially as the Cotswolds were approached, quite atoned for the rude south-west. Arrived at Cheltenham, of course the waters were tasted, and, equally of course, were voted nauseous, however hygienic they may be. But this must be whispered and not noised abroad, for it would be the basest of base ingratitude to hurt the feelings of our hospitable hosts, seeing that no stone was left unturned, from Mayor down to newspaper boy, to make the visitors, all and sundry, feel to the full how welcome they were to everything that comely Cheltenham could

supply. To begin at the beginning, the reader must betake himself in fancy to the spacious—but, alas! draughty—Winter Gardens, a Crystal Palace in miniature. Here in a

'A sincere and hearty welcome to the Delegates,' by the Mayor of Cheltenham (Col. RODGERS).

corner were to be found the Editor of the PRACTICAL TEACHER and the artist (Mr. J. Eadie Reid, Professor of Mural Painting at the Ladies' College, Cheltenham), who had been specially engaged to give some realistic touches, which are inserted for the benefit of those of our readers who were eating their Easter eggs elsewhere. Of course, these lightning sketches must of necessity fall somewhat short of exact resemblance, but our readers, familiar with the features and forms of the N.U.T. worthies, will have no difficulty in recognising the portraits. The Conference of 1898 will be remembered as the Corporation Conference, seeing that for the first time in the history of the N.U.T. the teachers 'conferenced' at the direct invitation of the Mayor and Corporation. Accordingly, the first act in the Conference drama is the reception of Delegates by the members of the Corporation, who, together with the clergy and local educational dignitaries, foregather on the draughty platform as the clock strikes two. In a speech of eloquent and evident sincerity his Worship shows that he has studied the aims, objects, and actions of the Union when he wishes God-speed to that Conference and voices a happy welcome to the assembled delegates from universal Cheltenham. To this succeeds an address from the Church of England clergy, who, by the way, had held special services, largely attended by Delegates, on the preceding Sunday.

The Rev. J. FOSTER welcomes Delegates on behalf of the Nonconformist Ministers of Cheltenham.

Not to be outdone in hospitality, the clergy of the various free churches had also their address of welcome, which was duly presented, with the greatly applauded hope that religious tests as a condition to admission into training colleges may disappear from our midst. Then up stands President Addiscott, and forthwith delivers the teachers' acknowledgments of these acts of courtesy, spicing his happy words with a pertinent reference to the address of welcome from the voluntary teachers of Cheltenham to Conference ten years agone. Dr. Macnamara follows with more references to the 1888 Conference, and to the making of Union history by Cheltenham in initiating the civic invitation. The waters came in for humorous and poetic mention, after which, acclamatory votes of thanks to the hosts, who, in the person of the Mayor, suitably respond, and Conference is left alone in possession of the palace of delight, which, however, has developed wretched acoustic properties, and is withal a trifle leaky. Then come the appointment of scrutineers, the adoption of standing orders, the adoption of the minutes of the Swansea Conference, and the instalment of Mr. Waddington as President for 1898. Whereupon Mr. Ellery moves the best thanks of Conference to retiring President Addiscott, who certainly deserves every word of the tribute. Mr. Hill, a Delegate from Mr. Addiscott's Association (Hackney), is fittingly allowed to second, and, in so doing, takes occasion to describe the ex-President as 'a Londoner in whom there is no guile.' Miss Broome is more happy when she speaks of Mr. Addiscott as an educationist, a scholar, and a gentleman. Most cordially were the thanks given, and in response the recipient thereof expresses regret that his year of office has closed without the passing of a Superannuation Act by the Government, and, as befits a scholar, sits down with an apt quotation from the 'Paracelsus' of Browning on his lips.

And now at length we have reached the Presidential Address, the main item of the day's proceedings. We give the substance of the address in another place. Here it will be enough to say that, although as a literary effort the address falls short of many of its predecessors, in earnestness and in conspicuous courage it is not to be surpassed by any preceding Conference deliverance. For earnestness turn to the concluding section, which deals with the hard lot of the child-toiler, and for almost heroic courage read the indictment of the manager, who places dogma and doctrine before mind development and character formation. Your Note-Taker is aghast at the spectacle of the Headmaster of a Church school sending out to the four winds of heaven the cry that the theologian blocks the way. That this is the opinion of the teachers of England was plainly indicated by the cheers that followed this daring declaration. At the conclusion of his address Mr. Waddington is quite hoarse, although many of the two thousand auditors had very imperfectly heard him, so badly is the Conference chamber adapted for hearing purposes. Dr. Macnamara, as is most fitting, proposes a hearty vote of well-deserved thanks, in support of which he proceeds to quote Russell Lowell's lines, viz :—

The Rector of Cheltenham.

> 'Every word that he speaks has been fiercely furnaced
> In the blast of a life that is lived in earnest.'

as literally characteristic of Mr. Waddington, to which we all say yea with our hands. Dr. Macnamara also proceeds to father the President's indictment of the theologian, but as he has to face no managers, clerical or otherwise, we do not remark upon the courage of this further statement, however much we may feel the truth thereof. A Bolton Delegate, Mr. Walker, has the honour of seconding the vote of thanks to Mr. Waddington, whom he compares with John Howard and William Wilberforce as a champion of the oppressed and helpless. The thanks being given, Mr. Waddington responds, and now we enter upon the reception of the foreign Delegates, particulars concerning whom, as well as their portraits, will be found in another part of this issue. All are present except the Irishmen, who have unfortunately been detained by the belated train; all say nice things and wish nicer for their English brethren, and all speak in English except M. Bronckart of Liège, whose remarks in French are translated by Mr. Gray. Thanks to the deputations, coupled with the expressed hope that arbitration may soon replace war—a very appropriate sentiment for expression at a time when international courtesies

are being exchanged—bring to a close this interesting part of an interesting session.

The Report of the Executive, a volume much too lengthy

'Dr. Mac'

'It would be impossible for him to adequately express, in the names of the teachers of England and Wales, their grateful sense of obligation to Cheltenham.'

for even outline notice, is at this stage formally presented to Conference, although the Delegates have been many days in possession thereof.

Then comes an event for which your Note-Taker, in common with many other Delegates, has been waiting, that is the declaration of the poll for Vice-president. It is announced that Mr. Clancy, of the Roman Catholic Cathedral School, Portsmouth, has been elected by an absolute majority over the other two candidates, Messrs. Jackman and Horobin, the exact figures being as follows :—

Clancy	.	.	15,506
Jackman	.	.	7,796
Horobin	.	.	5,877

The usual declaration-of-poll yells are not wanting, after which we are invited by Messrs. Bowers and Totterdill to thank the Executive and the permanent staff for their services during the year, which we accordingly do, and having re-elected without opposition Mr. Hamilton to the post of treasurer, the opening session is declared closed. Delegates rush to their respective hotels to snatch a hasty dinner, and then begins the busy evening, which is devoted to various **Conference side shows**, namely (1) The Annual Meeting of

Mr. Addiscott returning thanks.

the Teachers' Provident Society ; (2) the Meeting of the Association of Voluntary Teachers ; (3) College Reunions ; (4) The Ladies' Social ; (5) The Receptions at the two Political Clubs ; (6) The '73 Club' (Non-Collegiate Teachers) Dinner ; (7) Meeting of London University Graduates at Cheltenham Training College. Delegates may be seen hurrying from one function to another. Your Note-Taker presented himself at the Conservative Club where open house was kept, and where a most kindly welcome was given by the President, Dr. Ward-Humphreys, Mr. E. Wheeler, and others. Dr. Ward-Humphreys, the editor of the beautiful Conference souvenir, a copy of which had been sent by the 'Educational Supply Association' to every Delegate, came in for an ovation which he entirely deserves, for he has shown unexampled enthusiasm and devotion in his endeavours to make the visit to Cheltenham uniquely successful. Afterwards he looked in at the Liberal Club, where the President—Councillor Bence—entertained about 400 Delegates at his own expense, his strenuous efforts to make his visitors comfortable being seconded by a host of friends. Then away to Cheltenham Training College, where Principal Brenn presides over a meeting of London Graduates, intent upon keeping up the story of their *alma mater*. Other members of the staff looked in at the other gatherings, everywhere finding earnestness in business or abandonment to pleasure. It is safe to assert that very few Delegates saw their beds before midnight of the opening day of the Conference. A pelting downpour of rain made the travelling from one centre to another exceedingly unpleasant, as the most of us were not sorry to find ourselves snugly ensconced in bed, sinking into sweet slumber with pleasant thoughts of Mr. Wheeler and his myrmidons for the great care taken by them to ensure our comfort at the cost of their own. Mr. Wheeler we had met at the Conservative Club, and here he had announced that he and his had been hard at work re-erecting the platform in such a position as would ensure greater ease and success in making oneself heard.

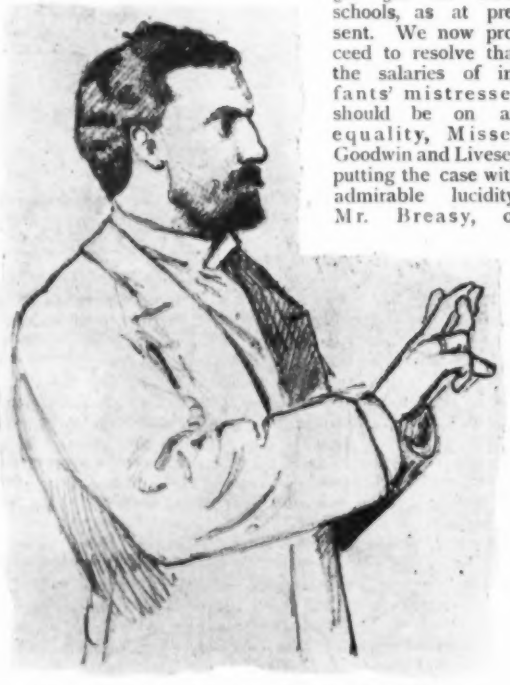
Mr. Ellery moves a vote of thanks to the retiring President.

College Reunions.—Of these pleasing functions, whereat old friendships are from year to year renewed, that of Battersea took place this evening at the 'Sydney Arms,' Principal the Rev. H. W. Dennis being in the chair ; that of Borough Road had its *venue* at the Royal Hotel, Mr. C. J. Dawson, B.A., presiding, while the non-collegiates banded together as the '73 Club' made merry together on the same evening at the 'Plough.' The gathering in each case was a pronounced success from every point of view.

Tuesday, April 12th, 8 a.m.—We begin to-day with the **Temperance Breakfast** and end with the **Conference Dinner.** The former is perforce fixed for the early hour of 8 a.m., but your total abstainer is nothing if not courageous, so that we muster strongly in the Corn Exchange, and are welcomed by Mr. Fenn, who does duty for Mr. Rae. The Rev. E. L. Roxby makes capital of the fact that the drink bill is ten times as much as the Education bill. Sir R. Cameron, M.P., claims to be a practical teacher and belauds the profession, and exhorts Delegates to further the cause of temperance. The President and ex-President propose a second vote of thanks to the speakers, and this fixture, dear to abstainers like your Note-Taker is at an end.

Second Session, 9.30–1.—The morning opens fine, yet we are in our places early, for the first act of the President will be the announcement of the result of the poll for the 36 members of the Executive. The elect are as follows :—**I. N. England :** (1) Bowden, (2) Donkin, (3) Phillips. **II. Lancashire :** (1) Sharples, (2) Pickles, (3) Holden. **III. Yorkshire :** (1) Peaker, (2) Cleghorn, (3) Sykes. **IV. N. Midland :** (1) Croft, (2) Beach, (3) Selvage. **V. S. Midland :** (1) Macnamara, (2) Rankilor, (3) Cohen. **VI. E. Anglia :** (1) Ellery, (2) Groves, (3) Gale. **VII. S. England :** (1) Blacker, (2) Goodwin, (3) Caudle. **VIII. W. England :** (1) Coward, (2) Butland, (3) Gregory. **IX. Wales :** (1) John, (2) Williams, (3) Jenkins. **X. N. London :** (1) Hicks, (2) Thomas, (3) Jones.

XI. E. London: (1) Blackburn, (2) Wild, (3) Hurden. **XII. S. London:** (1) Bowers, (2) Jackman, (3) Oliver. The most notable of the unelected are Messrs. Horobin and Muscott and Misses Broome and Hawley. We are now officially invited to Cambridge for next year's Conference by Mr. Iliffe, M.A., whose speech was pleasantly conceived and nicely delivered. With acclamation we accept the second civic invitation, and then Mr. Gray, in a vigorous speech, sets forth the grievances of the voluntary teachers, as caused by the iniquity of some of the Federations. Coming from a Tory M.P. the speech is refreshing in the extreme. The **Organising Master**, that 'unwelcome guest' in the schoolroom of the voluntary teacher, comes in for scathing condemnation. The system of **distribution of the grant in aid** is pronounced pernicious, since less is given to those who have helped themselves than to those who have made no such efforts. Then Conference has a dramatic illustration of the injustice of the Federation in London in the person of Mr. Morgan, late Head Master of St. Paul's, Canonbury, London, whose ten years' good service has been no bar to his dismissal. Mr. Morgan, in a few simple sentences, thanks Conference for the sympathy he has received, and everybody feels sad that such injustice is perpetrated in the name of Education. Previously to this, a motion condemnatory of the action of the Association has been passed. Messrs. Sharples and Thomas next plead for the total abolition of the variable grant, which, however, Mr. Thompson, of Chelsea, persuades Conference to refuse, in order to substitute therefor a plea for a grant dependent upon salaries paid, so that the greater a salary paid to a master the greater the grant per head payable by Government. This Conference accepts, but Mr. Addiscott steps into the breach and prevails upon the assembled Delegates to refer the whole matter to the Executive for consideration and report; so that Mr. Thompson's triumph is but short-lived. Next comes the turn of the **rural school**, it being resolved that the Voluntary Schools Grant should be paid to both urban and rural schools at equal rates, and not at the rate of 5*s.* 9*d.* for urban schools and 3*s.* 3*d.* for rural schools, as at present. We now proceed to resolve that the salaries of infants' mistresses should be on an equality, Misses Goodwin and Livesey putting the case with admirable lucidity. Mr. Breasy, of Hackney, advises us to condemn the Federations, formed under the Voluntary Schools Act for refusing to place teachers upon these bodies, but giving them what Mr. Tanner, of Finsbury, very rightly terms the 'snub direct.' There is no hesitation in acquiescing to this necessary proposition, and accordingly the Federations come in for their well-deserved trouncing, after which it is to be hoped they will render justice to their 'largest voluntary subscribers,' as the teachers undoubtedly are. Messrs. Sharples and Hale now ask Conference to declare against the action of the Federations in getting the managers of schools associated under them to reduce the salaries of their teachers, and Conference emphatically cries 'Agreed!' the opinion of every one being that such action is nothing short of monstrous. Another resolution forbidding parents who have been fined, either for neglecting to send their children to school, or for illegally employing children not exempt from total attendance, from sitting upon School Boards, meets with sympathetic acquiescence, as is meet that it should. And now we are close upon one, so without discussion we rush through a resolution calling upon the authorities to put the compulsory clauses of the Education Act into real force, which stands in the names of Messrs. Cook (St. Pancras) and Thomas (Executive); and at last the session closes with much slaughter of the innocents, as is usual as well as regrettable.



Mr. E. Gray, M.P., dealing with the dismissal of Mr. Morgan.

The General Secretary.

Tuesday's Side Shows.—One of these is the Conference Dinner, which is not regarded usually as a very important function. This year, however, the dinner is of supreme importance, for the reason that the Rev. T. W. Sharpe, who is to be testimonialised to-morrow, is to be present, and moreover, is to speak. And speak he does when the time comes, in a way extremely pleasing to teachers, but not so pleasing to the Education Department. Mr. Sharpe is evidently shaking himself, after freeing himself from the shackles of office, hence he is nothing if not plain spoken. He complains of the red tape that trammels all concerned in education, of the Conservatives who will not advance, of the **'animated broomstick,'** as the Art. 68 woman over 18 is facetiously termed, and of the absence of proper opportunity for the gifted pupils of the primary school. *Per contra* we are assured that retrogression is impossible, and that the municipalities, in the north at least, will not permit any schools to be set up to allow the child of the worker to be debarred from participating in higher education. This outspoken oration in the name of education has an admirable effect upon all present, which is not lessened when Sir Richard Temple, the champion of superannuation, prophesies that, granted a little patience and a little luck, a national pension scheme for teachers will soon become an accomplished fact. Of all the speeches delivered these two were the most notable. All things to the elated Delegate are now appearing *couleur de rose*. Meantime at the Devonshire Street School the Confederation of Rural Teachers are holding their annual meeting, Mr. R. R. C. Gregory, of Castle Cary, delivering an inspiring address, such as might be expected from the author of the 'Cheerman uv the Boord.' 'Only a village school teacher' is the burden o. his theme, and 'Efficient schools for the country child, pro-

fessional equality for the country teacher' are the moderate demands of the rurals, as eloquently voiced by President Gregory.

At the same time the **Evening Continuation School Teachers** are discussing their affairs at the Royal Hotel, whither we hie to find a crowded meeting of masters and a good sprinkling of mistresses, under the presidency of Mr. W. G. P. Smith, of the Metropolitan Evening Continuation Schools Association, assisted by Mr. Hennings, the Secretary, and Mr. J. J. Cullum, ex-President, bent upon organising themselves within the pale of the Union. Accordingly it is resolved, 'That this meeting is of opinion that it is desirable to immediately form an organisation to voice the opinions of Evening Continuation School teachers,' and again, 'That the N.U.T. be asked to summon a conference of Evening Continuation School teachers.' *Inter alia*, Mr. W. T. Wood hopes that the time will come when evening schools will be a compulsory part of the education of the country, and Mr. Totterdill, the President of the National Federation of Assistant Teachers, urges us not to rest content until 7s. per evening be the pay of the evening school teacher.

At 4.30 of this same Tuesday afterwards an exciting football match was played on the Montpelier grounds between the teams of Sheffield and West London. We understand that a most exciting exhibition of 'socker' was given, and that the best team—namely, Sheffield—won by 4 goals to 1.

College Reunions.—**Chelts** at the 'Sydney Arms' under the Principal and Vice-Principal, **Culhamites and Carmarthenites** under Mr. J. Colman, and later on Sub-Inspector Hole, and **Exonians** at the 'Queen's Hotel,' are the club fixtures for this evening, all of which are as successful as ever. At the Cheltenham meeting a subscription is made to provide a permanent memorial of the occasion; Exonians at the 'Queen's' have the sad task of appointing a successor and deciding on a memorial to their late Secretary, Mr. J. Porter.

After so busy a day the Delegate begins to wish himself back to school for a little rest, as the President expressed it later on in the week. A good night's sleep, however, puts one in condition for the morrow.

Wednesday, April 13th, Fourth Session, 9.30–1.0.—Long before 9.30 Delegates swarm into the Publishers' Exhibition and so into the Conference Room, and sharp to time President Waddington rings on the business. This is a motion to open up the Inspectorate to teachers, for which Mr. Pitt, of East London, has obtained precedence. Then comes the question of the **Coordination of Secondary and Primary Education,** the resolution being moved by Dr. Macnamara in place of Mr. Addiscott who is at the Cheltonians' breakfast. At first we are all delightfully unanimous in desiring that primary education shall naturally develop into secondary, under the same roof, if necessary, and certainly under the **same authority.** And then comes the rift in the lute. Strange to say, Dr. Macnamara advocates a composite body drawn from elected bodies such as was contemplated by the Secondary Education Act of 1896, just as he did at the Brighton Conference when he was handsomely defeated. Messrs. Gilham, Phillips, Jackman, and Hodge reproach the Doctor for his strange opposition to elective bodies, and a fierce controversy ensues, in the midst of which enters the Rev. J. W. Sharpe, whom we are to testimonialise at ten; but we may as well give the issue at once. Dr. Macnamara, in reply, so moves the feelings of his auditors that they lose sight of his bad *ad captandum* arguments, and albeit we claim a division—the first one of the Conference—we feel that the amendment, which aims at an **elective central authority,** is defeated, as, indeed, the event proves, the figures being—

Mr. C. Bowden.

For the amendment ... 7,959
Against the amendment 18,410

As the amendment cannot be put as the substantive resolution, the long heated discussion has been barren of definite result.

And now we turn to listen to the well-deserved praises of Mr. Sharpe, as sung by the President, the Vice-President, the ex-President, the Treasurer, the General Secretary, and the Secretary of the Education Committee. Each and every one

The Rev. T. W. Sharpe.

there bears testimony to the sterling worth of the ex-Chief Inspector, whose words and actions are extolled as the very pink of propriety and sympathy. We who have had to do with Mr. Sharpe personally do not tire of this well-earned praise that is embodied in the beautiful address which President Waddington at last presents to the genial Inspector, who in response touches upon the topics already referred to above in our account of the dinner, and in addition speaks of himself as a **lady's housemaid** fated to sweep up all the dust, of which there was plenty, at Whitehall. Then, in happy epigrammatic phrase, he depicts the model Committee on Education, an admixture of the old who lived in the past—**dreamers of dreams**—and of the young who lived in the future—**seers of visions.** As to the Pupil Teacher Report, the reforms embodied therein, we are told, will probably be long in coming, but their advent will be none the less certain on that account. And so with many a kindly word and wish the genial old man cheers the audience, who give a well-deserved ovation to the good and faithful servant who will, we are assured, give no poor account of himself as an educationist now that the miles of red tape are at length removed from his legs. We may inform our readers that we shall in our June number deal at length with the career of Mr. Sharpe as a Modern Educational Reformer.

And now we return to our subject, namely, the Conference proper. After Vice-President Clancy and the Irish Delegates have given us belated greetings, the former by illness, the latter by tardy trains, having been prevented from giving thanks and promises at the proper time, Secondary Education comes forward again, this time to find us unanimous in our declaration that 'no scheme of Secondary Education can be satisfactory that (1) treats Secondary Schools as a separate class; (2) does not arrange that the work of Higher Grade Board Schools and other Secondary Schools shall grow organically out of the work of the Primary Schools; and (3) does not provide Free Education throughout the various grades for every child showing the necessary ability,' which is the substance of the resolution brought forward by Messrs. Gilham and Sainsbury.

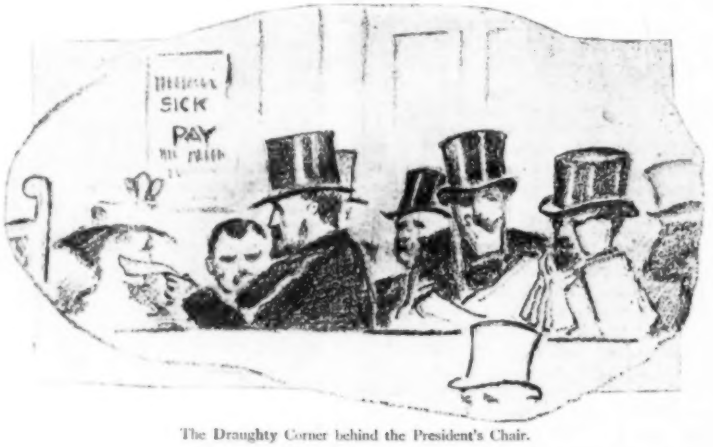
Mr. Thomas next moves and Mr. Cartwright seconds the resolution: 'That no scheme for the establishment of a Teaching University in London will be acceptable to the teaching profession which does not follow the precedent set in connection with the establishment of the University of Wales, by making provision for representation of all grades of teachers on the University Court or Governing Body.' Messrs. Wild and Welsh add words 'preventing the lowering of the standard and the examination of pupils by their own teachers,' which are accepted, and the resolution as amended

is unanimously carried. Then comes a rural rush, as a result of which we ask for a Committee of Inquiry of the House of Commons into the poor estate of the rural teacher, and proceed to condemn the disgraceful condition of rural schoolhouses. Time presses, and in a few minutes it will be one. Still we find time to resolve that all certificated teachers shall be present at the Conference between the Inspector and the Head Teacher, and to demand that no Log Book entry shall be made concerning any certificated teacher unless the said entry be made known to the teacher at the time.

Messrs. Croft and Pickles bring the session to a close in passing the following resolution on salaries: 'Seeing that 44 per cent. of the certificated class masters in church schools receive less than £75 per year (or 28s. per week), and only 6 per cent. more than £100 per year: seeing also that 35 per cent. of the certificated class mistresses in church schools receive less than £50 per year (or 19s. a week), and only 4 per cent. more than £75 a year, this Conference, in directing attention to this deplorable state of affairs, trusts that, in the best interests of education and the children attending the Voluntary Schools, the newly-formed Association of Schools will devote a considerable portion of the new 5s. grant towards improving the remuneration of the certificated class teachers referred to, although it recognises that the sums allocated to the Association are totally inadequate to render anything like full justice to such teachers.'

The Third and Fifth Sessions, viz., those of Tuesday and Wednesday afternoons, are private, so that interesting as they were, your Note-Taker is precluded from giving publicity to his notes thereupon.

At the conclusion of Wednesday's business, a large proportion of the Voluntary teacher-delegates remain behind in the Conference room in order to take steps to form a Voluntary Teachers' Organisation within the Union. All the more influential of the Voluntaryists, with Messrs. Waddington, Ellery, Beach and Blacker at their head, declare their resolve to form such an Association, and upwards of a hundred names are thereupon enrolled.



The Draughty Corner behind the President's Chair.

Mr. Ellery is elected President, Mr. Rankilor Vice-President, and Mr. Blacker Secretary for the time being, and thus the National Federation of Voluntary Teachers is given an excellent send-off in the Conference chamber itself.

Wednesday's Side Shows.—'After dinner rest awhile' does not apply to Conference Delegates, rather must they 'run a mile' or two if they wish to see what is to be seen. Accordingly the note-book is hurried from Conservative Club to Liberal Club, in each of which institutions we find overflow smoking concerts in full swing, and so to the chief side show of all, namely, the **Mayoral reception** in the Assembly Rooms. When it is said that more than two thousand persons were received, it will be understood what a glorious crush there must have been. And so in good sooth there was, so much so that the note-book only submits to the pressure sufficiently long for the Note-Taker to observe the tasteful art-muslin drapery that beautifies the walls, to listen to the sweet voice of Miss Laura Davis, and to sample upstairs the animated photographs manipulated by Mr. Howling. Not only were the delegates present in their hundreds, but Colonel Rodgers, who does nothing by halves, has gathered together all the notabilities of Cheltenham and its vicinity to do honour to England's teachers in Conference assembled. The function was completely successful from every standpoint.

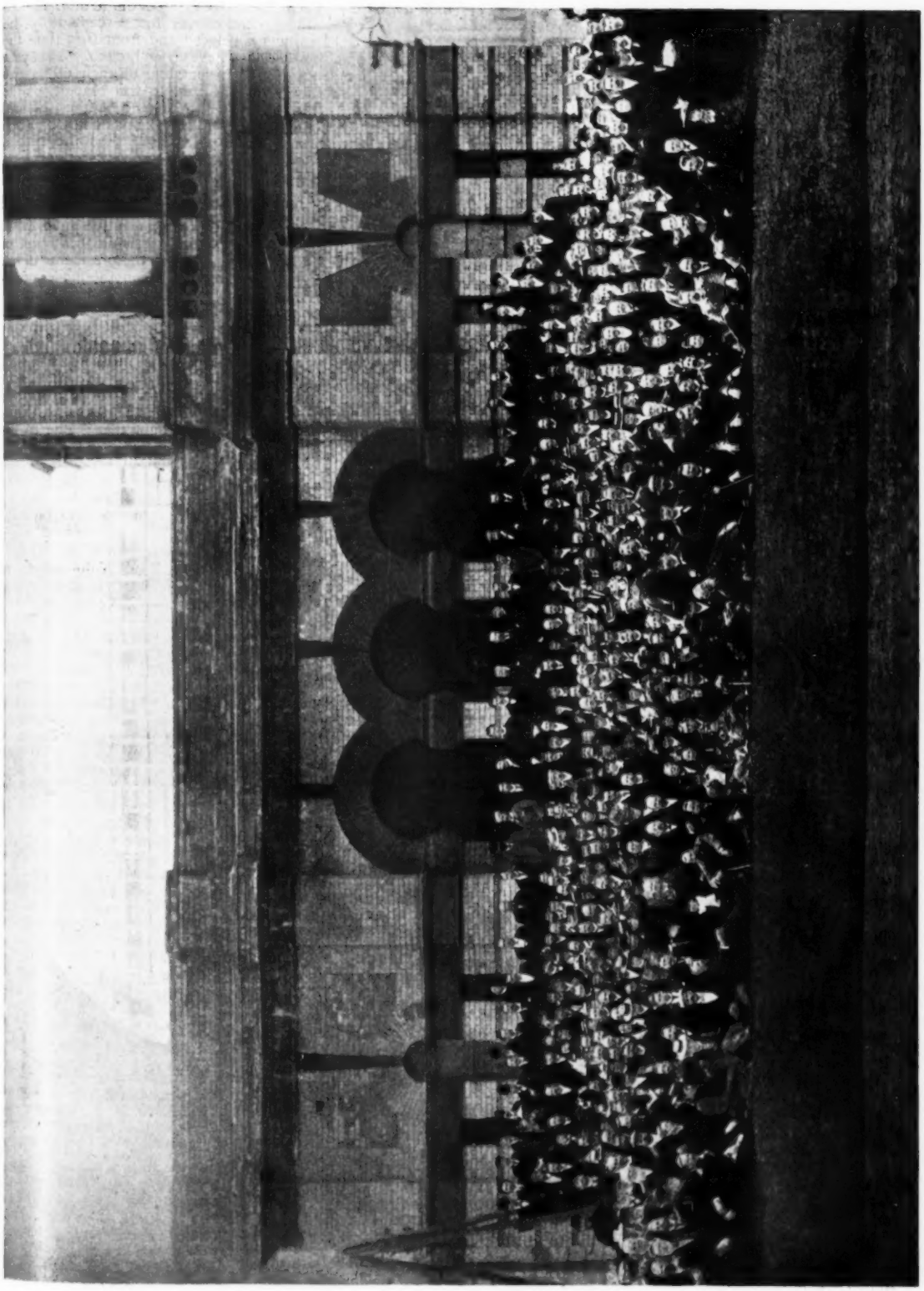
Old St. Mark's-men 're-unioned' at the 'Sidney Arms,' where Messrs. Tarren, Gunning, Iliffe, and Ellery made interesting speeches, the latter referring to the approaching realisation of the desire of his heart in the shape of the passing into law of the Superannuation Bill.

Sixth Session, Thursday, April 14, 9.30 a.m.—Although it was intended that we should by this morning be out of the troubled sea of contentious matter and in the calm waters of votes of thanks, Alderman Thompson is not content to let this be so; accordingly at 9.30 he moves the suspension of the standing orders to permit him to invite Conference to declare that the Executive has exceeded its powers in altering Rule 32, which has to do with nominations. On the promise that the matter should have careful consideration, the Alderman lets the matter drop, and now we vote thanks generally with acclamation (1) to the **Town,** (2) to the **Press,** (3) to the **Benevolent Committee,** (4) to the **Local Committees,** (5) to the **Scrutineers,** (6) to the **Local Officials,** with illuminated addresses to Messrs. McFee, Weaver, Lyon, Weaver the Chairman, Vice-Chairman, Treasurer, and Secretary respectively of the Conference Committee; (7) to the **ex-President,** with an illuminated address, and finally to the **President,** and the sessions of the 1898 Conference come to an end. Not so the business, however, for we plunge at once into the discussion of the affairs of the **Charities,** the **amalgamation** of the funds being the burning subject. It is finally resolved—

That the funds be managed by a Council of 40 members, meeting monthly, called the Central Council of the Charitable Funds, one half, including the officers of the Union, to be elected by the Executive of the National Union; one fourth, not members of the Executive, to be elected by the subscribers to the Orphanage and Orphan Fund; and one fourth, not members of the Executive, to be elected by the subscribers to the Benevolent Fund.

The Annual General Meetings of the Benevolent Fund and of the Orphanage and Orphan Fund next take place, the most interesting item of news in connection with which being the announcement of Mr. Passmore Edwards' munificent offer to build an Orphanage at a cost of from £5,000 to £6,000, on condition that the teachers provide a site. It is needless to say that Mr. Edwards is most heartily thanked for his generous offer. Once again we file out of the Winter Gardens, which has been undergoing transformation, even during our presence, for the Reception of Purses in the afternoon.

The Purses: £7,200 contributed.—Lord Beauchamp, the Chairman of the London School Board, with his sister, Lady Lygon, surrounded by officials of the Union, are gathered on the platform of the Conference Room when we betake ourselves thither in the afternoon. Sweet music is discoursed as a preliminary, and then the procession of the purses begins, Lady Lygon relieving the holders of their precious burdens with sweetness and grace. Her ladyship wears a dress of cornflower blue, with ivory satin and jewelled vest. Her hat is a toque of velvet and ivory lace, and she wears a pearl necklace. Previous to the presentation, Principal Brenn's little daughter presents Her Ladyship with a bouquet of orchids and lilies of the valley. Whilst we are waiting to learn the total amount contributed, a vote of thanks to Lady Lygon is proposed by Mrs. Burgwin, seconded by Mr. Addiscott, and supported by the Mayor and Mr. Ellery. We carry this with acclamation, and Earl Beauchamp responds sympathetic-



A GROUP OF DELEGATES IN THE WINTER GARDENS.
(*Photo by Norman, May & Co., Ltd., The Promenade, Cheltenham*, *see page 588*.)

ally, letting it be known incidentally that he hopes the London School Board will more adequately recognise the services of the teachers in its employ. His Lordship also reiterates his desire to see many of the Delegates at Madresfield, his county seat. And now comes the announcement of the total—£7,200, a goodly sum, if, alas! £3,000 less than last year's total, and only a little more than half the Manchester total.

East Lambeth, with its grand total of £645 2s. 8d., wins the trophy for the highest total, and Chepstow again carries off the shield for the highest individual average, which this year is £2 10s. per head. And now we are singing the National Anthem, and of Conference items there remain but the Ball and the Excursions, to which, however, is to be added a Concert to be given this evening by Conference Delegates in aid of the Cheltenham Charities.

The Ball was attended by over 300 representatives and friends. The programme is given below, and it remains but to say that in every sense of the word the ball was a pronounced success.

The duties of M.C.'s were efficiently performed by Mr. E. Gray, M.P., and our genial friend, Mr. J. Davis.

For those who wished to avoid the discomfort of a crowded dance, the Committee had arranged an interesting programme of vocal and instrumental music in the upper hall.

The Excursions are dealt with in a special article.

The Concert resulted in a gain of £19 for the purpose mentioned above. And now we have come to the end of our notes, and, pausing for a moment, look back on the Conference as a pleasant if somewhat arduous experience, the sweetest thought in connection therewith being the lesson of the growing importance of the teaching profession as proved by the Cheltenham Conference.

A word must be said about the excellent group of delegates (from which our reproduction, has been taken) photographed by Messrs. Norman, May & Co., Ltd., of the Promenade, Cheltenham. As doubtless many of our readers may wish to avail themselves of a copy of this group to retain in more permanent form, we are able to say that Messrs. Norman, May & Co. are prepared to supply photographs at the following rates, viz. :—

Ordinary, mounted (size 12 × 10) - -	2s. 6d.
Platinotype, mounted (size 12 × 10) - -	3s. 6d.

A larger size (15 × 12) has also been prepared, and copies of this are issued at 5s. for the ordinary photograph, and 7s. 6d. for the platinotype.

WITH THE FOREIGN DELEGATES.

BY C. J. ADDISCOTT, B.A.,

Ex-President of the N.U.T.

'Thy stranger that is within thy gates.'

'IN Education we know of no geographical frontiers,' said the present ex-President of the Union at Brighton in 1896, and this is a truth which is sinking deeper and deeper into the inner consciousness of the N.U.T. and its leaders. 'Made in Germany,' and all that the phrase implies, has a meaning in the educational, as well as in the commercial, world, and an interesting article might be written upon the close connection which exists between the recent new educational ideas governing our primary schools—at least, in so far as these ideas are embodied in the Code and 'Instructions'—and the pre-existing conditions which governed Continental primary schools.

During the last four or five years we have been importing largely from our friends *d'outre mer* in such matters as the school curriculum, inspection, preparation, entry, and revision of lessons, etc. We have seen the establishment of a Government department for making special enquiries into Continental systems and methods of education, and have had the benefit of the first-fruits of its labours in the valuable 'First Volume of Reports.' All this lends special emphasis to those functions of the N.U.T. Conference in which 'the strangers that are within our gates' took a share. We have read much, and heard much, of the Belgian, the French, the Dutch, the Swiss, the German teacher; we now have an opportunity of seeing some of them in the flesh, and of taking their measure. When, many years ago, the Union invited foreign delegates, the invitation was first accepted by the 'Fédération des Instituteurs belges,' and from that time the bond of personal presence has never been broken. This year the Federation sends us a representative of each of its two sections. I have already explained to the readers of the PRACTICAL TEACHER the constitution and method of procedure of the Belgian Conference. It holds its sittings in two sections, French and Flemish. Each meets on the second day of the Conference, each unifies—by selection and rejection—the reports sent up by the various *Cercles*, or Associations, upon the various questions submitted to them from the Executive. Upon the third day, at a joint meeting, the conclusions of the two sections are brought into harmony. It will therefore at once be seen that an essential condition of success is a good understanding between the presidents of the two sections. In any divergence of opinion the moderator is our old friend M. Van den Dungen, who was last seen among us at Manchester, and to whom the very existence and the maintenance of the Federation, as an educational power in Belgium, is largely due. We have now had an opportunity of judging of the two sectional presidents in the persons of M. Arnold Bronckart and M. T. G. Cuypers. To a French-speaking Englishman one minute's conversation in French with these gentlemen reveals the fact that M. Cuypers speaks French 'with a difference,' and no doubt this is due to his Flemish affinities.

M. Bronckart has for many years been President of the French section, and is regarded as one of the indefatigables in the cause of professional Union among *les Instituteurs et les Institutrices belges*. He sends me a modest biographical note; here it is :—

> Je suis directeur de l'institut Communal du Sud et de l'école supérieure d'adultes de Liège, membre du Comité général et du Comité exécutif de la fédération des instituteurs belges, président de la section provinciale de Liège et de la section de langue française.

The *Comité général* here mentioned corresponds to our Executive. It is formed by the votes of the members of the *Cercles*—taken locally. *Le Comité exécutif* consists of the officers—*i.e.*, the President, Vice-President, Secretary, and Treasurer, and, in addition to these, the Presidents of the two sections. By this executive Committee, meeting in Brussels, the work of the Federation is carried on throughout the year, and the policy of 'trust your Executive' becomes, in Belgium, 'trust your officers.' M. Bronckart is therefore an officer in the fact that he is a sectional president. I may further explain that 'la section provinciale de Liège' would with us be represented by a district union having a large manufacturing town as its centre. M. Bronckart exercises in Liège a widely-felt influence. A teacher's power and prestige depends there, as everywhere else, primarily upon his personal qualities; but in Belgium much is also due to the importance of the town in which he works. His salary is graded according to the number of inhabitants of that town; promotion is slow, and largely depends upon the possession of special qualifications; the result is, that the largest towns possess the most distinguished teachers. M. Bronckart is a man of great reserve force, speaks little, but says something when he does speak. He did not address us in English, but, like one of G. Eliot's characters, he 'can hold his tongue in seven languages,' and, speaking or silent, is an effective force in 'La Fédération des Instituteurs belges.'

M. T. G. Cuypers may be thus introduced :—

> Il est instituteur à St. Jooseten-Noode (Bruxelles), membre du Comité général et du Comité exécutif de la fédération des instituteurs belges, président de la section provinciale de Brabant et de la section de langue flamande.

Together the Belgian delegates represent some 3,600 teachers working in the State schools. The teachers of *les écoles privées et Confessionnales*—under the control of the priests and other representatives of the *Cultes*, or religious denominations—do not appear as a public body discussing public questions, nor have they ever sent a representative to an English Conference of Teachers. The teachers of the State schools can publicly discuss educational questions so long as they are not of a religious or political nature. I was

therefore, not unprepared for the answer which I received to the question put to our Belgian friends :

> What, in your opinion, is the chief feature of our Conference?

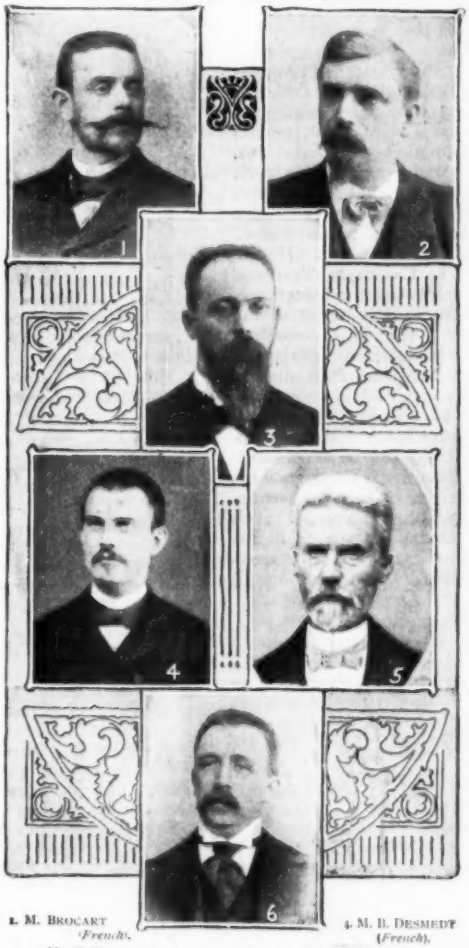
promptly came the reply :

> C'est la liberté, la franchise de vos discours, et au point de vue des sujets, et au point de vue de la manière et de la methode.

It might be of interest to give the actual text of the speech of M. Bronckart, made in reply to the public reception given him at the Conference :—

> M. le Président, Mesdames, Messieurs,—Je vous prie, tout d'abord de vouloir bien m'autoriser à m'exprimer en francais. La fédération des instituteurs belges, que mon confrère et ami, M. Cuypers, et moi, représentons ici, nous a envoyés à cette conférence pour vous renouveler les sentiments d'estime et d'affection de tous ses membres, et resserrer, si possible, les liens de fraternité qui unissent les instituteurs des deux nations. L'accueil si cordial que nous avons demontré dès notre arrivée en Angleterre, et qui ne s'est pas refroidi un seul instant ; les paroles aimables que votre honorable président vient de nous adresser, et les acclamations chaleureuses dont vous les avez reçus, sont pour nous des témoignages certains que nos sentiments sont partagés, que vos cœurs et les nôtres battent à l'unisson. S'il m'était permis de dire un mot de moi-même, je vous rappellerais que j'étais aux conférences de Leicester en 1884, de Birmingham en 1889, de Cardiff en 1891, et j'ajouterais que j'ai emporté de chacune de mes visites un souvenir si precieux que c'est avec un véritable bonheur que j'ai accepté la nouvelle délégation que mes confrères de Belgique ont bien voulu me confier. Permettez-moi maintenant de vous féliciter sur l'extension considérable que, grace à vos communs et persévérants efforts, votre association a prise, de la puissance dont elle dispose, puissance telle qu'elle vous a donné le moyen d'envoyer au Parlement plusieurs des vôtres, pour y porter la bonne parole en faveur du progrès de l'éducation populaire et de situation materielle et morale des instituteurs.
>
> 'Au Congrès de Liège votre honorable Président, Mr. Addiscott, parlant des pensions émittait l'espoir que les instituteurs anglais seraient mis sur le même pied que leurs confrères belges. Soyez assurés que ceux-ci espérent avec vous que bientôt vous aurez gain de cause et que comme les autres serviteurs du pays vous obtiendrez une pension en rapport avec vos services. Vous avez adressé des remerciments aux délégations étrangères pour leur présence. Permettez-moi de vous remercier à mon tour de la cordialité avec laquelle vous pratiquez l'hospitalité envers les étrangers. Vous avez également exprimé, à propos de l'education populaire une opinion que mon ami Cuypers et moi, nous partageons entièrement. Oui, j'affirme avec vous, que partout, l'education a le devoir de développer chez les élèves, en même temps que l'esprit national, les sentiments de fraternité et de solidarité envers les autres peuples, afin de former des générations qui, dans l'avenir et pour le bonheur de l'humanité sauront resoudre les conflits par l'adoption d'arbitrages pacifiques et autres manifestations de bienveillance internationale. Je termine en faisant des vœux ardents pour la réussité de votre Congrès.'

THE FOREIGN DELEGATES.



1. M. BROCART (*French*).
2. Mr. G. MEIJER (*Dutch*).
3. M. CUYPERS (*Belgian*).
4. M. B. DESMEDT (*French*).
5. M. A. BRONCKART (*Belgian*).
6. Mr. A. STOKVIS (*Dutch*).

We now turn to the country of the dunes and dykes, and study three of the most typical Dutchmen that could possibly be sent to us. Mynheer Meyer stands head and shoulders, physically and in many other respects also, above his confrères in Holland. When he came in sight the question was often asked me, 'Who is that splendid American-looking man?' Our own handsome men paled before him. M. Meyer was born in 1854 in the village of Veendam in the province of Gröningen. His native village school knew him until he reached the age of 13. At 15 he passed his entrance examination for the Training College in Gröningen. Here he passed the customary four years, obtaining his diploma in 1873. Every teacher is trained to become an assistant, experience and further examination being necessary to qualify for a headship. M. Meyer went to Arnhem, remained there six years, and in that time qualified for a head mastership, and also obtained diplomas in three modern languages. His special knowledge and aptitude for history and language procured him an appointment as professor (*leeraar*) of these subjects in the great Training College in Amsterdam in 1879, and last year, when M. H. Bouman retired from the Principalship of that institution, M. Meyer was selected to fill the vacant post — an appointment which, I am assured by the teachers of Amsterdam, has given the greatest possible satisfaction. The Amsterdam Training College is the only one in Holland into which both male and female students are admitted. M. Meyer is also a member of the Commission which examines teachers for their diplomas, and a testimony to the way in which he has carried out his duties as examiner is given in the fact that he has this year been made President of the Dutch Teachers' Union — 'Den Nederlandsch Onderwyzers - Genoostschap' (popularised at our Class Teachers' Conference as 'Underjibbers')—a position which he will probably hold for many years to come, for the office is not held as with us for one year only. At Cheltenham his manly bearing and clear-cut English won him all hearts, and filled us with envy, that probably no principal of an English training college could be found who could address an audience in Dutch, as did M. Meyer in English. In speaking of the visit of the N.U.T. President and Vice-President to Holland last year, said M. Meyer,—

> 'We took as much care of them as we were able to do,'

with a turn in the phrase that made the Conference chortle. And again,—

> 'Although we are only at the beginning of your Conference, we have experienced so much kindness that I think we could at once go home and tell our brethren how strong is the feeling of fraternity between the two unions.'

From this he goes on to tell us of their efforts to obtain pensions, not for the teachers—that has been long an accom-

plished fact—but for the widows and orphans of teachers, and *we still wearily hope for the initial step.*

> 'We are trying to raise salaries to such a level as to allow teachers to live as civilized persons should. We are rejoicing at the prospect of compulsory education.'

May they get it in deed and not in name only, for my experience teaches me that the country sorely needs it.

> 'We are trying to get a better connection between primary, secondary, and higher education.'

So we are made at once kin by kindred interests.

> 'The endeavour for the self-same ends,
> With self-same hopes and fears and aspirations.'

Good wishes for the Conference and this beautiful town of Cheltenham closes M. Meyer's address.

The second delegate, Mynheer A. Stokvis, stands to represent the class teachers of Holland. Although the N.O.G. had existed for 50 years, he was the first class teacher elected upon the Executive—in 1893—and has so well justified his position there that the N.O.G. two years ago made him its treasurer. In the Amsterdam Normal School he was a pupil of M. Meyer. At 18 he received his diploma as a teacher, and at 21 his full diploma as head master, that is, 'the certificate of complete competence for teaching and superintending a whole school.' He is also certified to teach French and Drawing. He has been Secretary and Vice-President of the Class Teachers' Association in Amsterdam, and so rapidly has the influence of the class teachers increased, that to-day the Executive of the N.O.G. consists of four head teachers, four class teachers, and M. Meyer, who belongs to neither class. M. Stockvis has justly earned the reputation of a hard worker in the cause of professional union. Had the energy which he has thrown into the work of the N.O.G. during the past six years been spent in passing the examination upon which his own future promotion depends, he would, in all probability, now be in the ranks of the head teachers. He feels he has done his duty to his profession, and I believe it is his intention to make a new departure in his own interests next year. To use a French phrase, 'May he arrive,' and that soon. His speech at the dinner was marked by a sense of humour and a keen appreciation of the position of the class teacher. One extract from it must suffice :—

> 'Why are the English the brightest people in Europe, although by your own showing your schools are deficient? What mighty people you would become when the forces sleeping and dreaming in the heads of poor boys and girls were awakened by sufficient food and education. What do you call an assistant? They tell me it is the teacher of a class, but I do not think so; the man who has the whole task in a class cannot be called an assistant. Is it true that the class teacher if he has a wife and children must supplement his work by night classes? Is it true that with you, too, women are paid less than men; voluntary teachers less than board teachers; teachers in the villages less than those in the town; that your classes are so large that you cannot get on without corporal punishment? If all this be true I should like to ask—Why?'

To my question as to what, in our Conference, most interested him came the reply, natural to a young man :

> 'The large proportion of ladies, and how charming they were.'

For the first time in the history of the N.U.T. we are honoured by the presence of delegates from France, or rather from the Department du Nord de France, for there and there only in France are the teachers allowed the freedom of combination, and that only on the condition that religious and political questions are not touched, hence the title of the Association, 'L'Association des anciens élèves de l'école normale et des instituteurs et institutrices laïques du Nord.' Twelve hundred teachers were represented by Messieurs Brocart and Desmedt, the first from Lille, the second from St. Amand, a village some 10 miles from Lille.

I introduce Mons. Brocart in his own words :

> 'J'ai trente-deux ans. Je ne suis pas élève de l'école-normale. Je me suis préparé à mes fonctions d'instituteur dans l'école Communale de mon village. J'ai débuté à Bousies, Nord en 1884; j'y ai été chargé d'un cours élémentaire jusqu'en 1890, époque à laquelle j'ai été appelé à Launoy-du-Nord, petite ville industrielle près de Roubaix. En 1895 j'etais envoyé à Lille où j'exerce en qualité d'instituteur-adjoint à l'école Municipale de la Rue de Colmar. Notre president me charge de vous dire afin que vous vouliez le répéter dans votre Journal que notre Association est très honorée de l'invitation qu'elle a plusieurs fois reçu de se faire représenter au Congrès de la N.U.T.'

M. Brocart's neat little speech on the Monday was a simple expression of goodwill from France to England in so far as these countries were represented by teachers, and that the cordial relations now existing may continue and be strengthened. It was delivered in excellent English. M. Brocart is a keen observer, has gathered the harvest of a quiet eye, and will have much to tell his colleagues in Lille. No man enjoyed his visit to Cheltenham more than M. Desmedt. His face radiated happiness from the first moment to the last. He was *un exemple ambulant* of what a contented life in a village, lived under the conditions of security of tenure and superannuation, could produce.

> 'M. Desmedt est un ancien élève de l'école Normale de Douai (1879-82), a été instituteur adjoint à Roubaix. Il dirige l'école de Brouille, St. Amand. À la suite d'un concours en Juin 1894, il fut l'un des trois instituteurs désignés par le Conseil Général du Nord pour faire une séjour en Angleterre. Il en profita pour visiter l'Écosse, Dublin, Bristol, et le Sud de l'Angleterre. Il suivit à Londres les cours du Battersea Training College. Il rapporta en France le meilleur souvenir de bon accueil qu'il reçut partout, et dans son journal de voyage, il s'etend volontiers sur les qualities de bon sens, de sens pratique de ses confréres anglais, sur leur esprit de fraternité, de solidarité pour le bien, l'honnêteté de leur travail scolaire, si utile à la nation anglaise et qui mérite à si juste titre tous les encouragements des pouvoirs publics et des autorités locales.'

M. Desmedt returns to France to take up a better appointment than that of St. Amand—he received news of it while in Cheltenham. We congratulate him, and may his shadow—also no mean one as an ex-president said of the Rev. T. W. Sharpe—never grow less. I cannot conclude this notice without a word concerning the genial Dutchman, Mynheer Van Dam, of Rotterdam, who stands as the personification of the Englishman's ideal Dutchman. No man gets more enjoyment out of life, and his joy was contagious. 'Wont to set the table in a roar' he was everywhere a welcome guest. Not sent as a delegate he came as a friend and a lover of everything English, and the Rotterdam teachers will in the future know much more of their English brethren than they have known in the past. In speeding our parting guests we assure them of our admiration and esteem. They have played a part in this Conference mutually helpful. By meeting them we shall learn to love one another, not sentimentally but fundamentally. The vast shuttle of modern life is weaving together all races and creeds and classes; our arbitrary and insular prejudices are no part of the divine order of things, and we must get to know each other to the breaking down of prejudice and the development of human sympathy.

CONFERENCE AT PLAY.

[BY THE SILENT MEMBER.]

THE Editor of the PRACTICAL TEACHER is surely a humourist. Knowing full well that I have had to sit out every session of Conference, and, moreover, write some twenty columns of descriptive matter in the evenings, he nevertheless deems me the proper person to dilate on 'Conference at Play.' After all, it may be that the Editor is not a humorist but a philosopher. He probably recognises that those who work hardest play hardest, that those whose relaxations are few, gather their joy in double handfuls while they may. Conference happily does not, as Colonel Hay puts it, 'rezoloot till the cows come home.' I trust it never will, for Eastertide, be it remembered, is, after all, a holiday season. I have no sympathy with those zealots who want the sessions extended *ad infinitum*. I confess to feeling a cold perspiration when a gentleman from Llanelly urged Conference not

to allow itself to be separated until certain important but remote matters had been reached. I knew the temper of certain deadly earnest members, and I feared for the worst. But, happily, the good sense of Conference triumphed. The

The Silent Member.

ruthless enthusiast from South Wales did not get even a seconder. He did not deserve it. Had he succeeded, Dr. Macnamara and I should have retired at the end of the week to what Mr. Toots was wont to call 'the silent tombs.'

Cheltenham is essentially the town for a Conference. Its very motto, *Salubritas et Erudito*, indicates the dual aspect of the N.U.T.'s annual gathering. Its profusion of turf and trees, its sweet serenity, its soft, luxurious atmosphere, its exquisite setting of hill country, make it one of the most delectable of English resorts. Its varied charms and its social predispositions encourged many a representative to anticipate the play hours of Conference with more than ordinary pleasure.

The advance guard, the fatigue party, so to speak, those who go back to school as the President playfully put it 'to get a bit of rest,' arrived on Thursday evening, all agog for a couple of days' amusement before the serious work of Conference began. Good Friday was an exquisite day. A Yankee has described our English climate 'as a darned lot of samples.' Good Friday was a Riviera sample. The sun shone brilliantly, the sky was cloudless, there was a caress in the breeze, and a balm in the air. Under the guidance of Messrs. Wheeler and McFee a drive was arranged to Winchcombe and Sudeley Castle From the summit of Cleeve the party stood entranced with the beautiful landscape of the Severn Valley—a rich agricultural country, over which brooded the very spirit of peace. The orchards were white with apple blossoms, the woods were putting on the fresh greenery of young foliage, everything was fragrant, inspiring, delicious. The little ancient town of Winchcomb, once the capital of Mercia, with its historic houses, its gargoyled church, and its quaint byeways was found deeply interesting. Mrs. Dent threw open Sudeley Castle to the visitors, and added to their pleasure by graciously receiving the party. One wandered through the magnificent apartments, stored with antiquarian treasures, walked in the Queen Anne gardens, piously visited the tomb of Catherine Parr, and gazed on the beautiful Gloucestershire meadows with a delight which it would be rank ingratitude not to acknowledge.

April responded copiously to Mr. William Watson's invitation 'to weep her girlish tears' on the Saturday morning. But the afternoon was sufficiently fair to permit the first excursion in the Conference programme to take place. This was a large brake and cycle party to Chedworth, where, perhaps, the most interesting of all the Roman remains in Britain are to be found. The Chedworth Villa, situated in a vale in the very heart of the Cotswolds, makes the Roman occupation of this country a reality. The walls remain almost in their entirety, one bath is nearly perfect, the tesselated pavements are, in many places, quite unbroken, the forge, the pillared walks, the fish pond, all may be seen. Mr. John Sawyer, who accompanied the party, described the remains with a lucidity which made the Roman farm life of the time almost live again before our eyes. Hard by was the great Foss Way, along which the Roman transport waggons and mounted couriers, hot foot on military service, passed daily.

Though Sunday was a dreary dripping day, many representatives braved the weather and visited Leckhampton and Birdlip, two pretty villages on the slopes of the Cotswolds, overlooking the garden town.

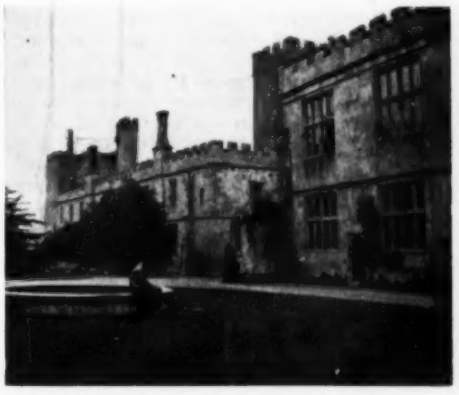
Monday morning was devoted to lounges in the promenade, to visits to the Pittville Gardens, to saunters in the immediate neighbourhood. When Conference rose after its first session, out-door enjoyments were out of the question. Notwithstanding, the evening was an ambrosial one. The ladies met for music and conversation at the Imperial Rooms. Miss Broome, Mrs. Macnamara, Miss Conway, Miss Gadie, and Mr. Mark Russell, and others contributed songs and piano solos, to a delighted audience.

In various hostelries throughout the town, the air was redolent of smoke and fraternity. The 'Old B's,' the 'Old Sinjuns,' and the '73 Club fell on one another's necks, and recalled the little something-nothings of the old days when every goose was a swan, and grey hairs were æons away.

On Tuesday afternoon a large number of representatives left Conference early to witness the Charity Football Match between the West London boys and the Sheffield boys. The weather was charming, and the Montpelier Gardens in themselves were worth a visit. After a game which was an 'eye-opener' for the inhabitants of a town devoted to 'Rugger' football, the Sheffield boys came off winners by the substantial score of 4 goals to 3.

The Conference Dinner, which took place on Tuesday night, was a somewhat exclusive affair. The average Conference representative would have found it difficult if not impossible to secure a ticket. The 'Plough' accommodation was limited, and the official guests were many. The repast was elegant, and the speaking of a distinctly high order. Mr. Sharpe, late Senior Chief of the Education Department, and Sir Richard Temple were the most prominent of the guests. I have never heard better after-dinner speeches than those of Messrs. Yoxall and Gray. For airy persiflage and amusing 'chaff,' I thought them unsurpassed. Mr. Sharpe's description of the Art. 68 teacher as 'an animated broomstick' tickled his audience hugely.

The great majority of the representatives clustered at the various 'smokers,' or attended one or other of the College Reunions. The Culhamites, the 'Old Chelts,' the men from Westminster met in great force. An amusing interlude was provided at the 'Old Chelts' reunion. Three ladies, ex-students of St. Mary's Hall, attended 'as a protest against the exclusion of the ladies from the 'Chelt Reunions.' Convicted of neglect, the gallant but thoughtless Chelts made instant and enthusiastic promise to repair the omission in future. And here, one might notice that the organisation of



Sudeley Castle.

the ladies' concerts has been a special feature of this year's Conference. The ladies have been left out in the cold too long.

The Mayoral Reception on Wednesday evening was in every way a most delightful affair. Almost every representative

was present, and the Assembly Rooms, specially decorated for the occasion, presented a most animated scene. There was some capital music and an exhibition of the cinematograph, which was much appreciated. At the Political clubs, thrown

The Chapel at Sudeley Castle in which the remains of Catherine Parr are interred.

open for the week to all representatives, irrespective of party, excellent and well-attended smoking concerts were arranged. Rarely, indeed, have the local authorities so pleasantly exerted themselves to entertain their guests as on the occasion of the Cheltenham Conference.

The Conference Ball, held on Thursday evening, was a distinct success. The splendid floor, the excellent band, the pretty dresses, the bright faces, the charming decorations, the infectious spirit of gaiety that was abroad, made the evening one to treasure. Those who were past their dancing days, or less devoted to Terpsichore, found their enjoyment at the Winter Gardens, where an admirable concert was given by some of the representatives. The singing, especially that of Mr. Ben Johnson, and the recitations, notably Mr. Gregory's amusing sketch, were altogether worthy of a body that is extraordinary for its versatility. The proceeds, which amounted to £19, were devoted to the local charities. The happy idea of holding such a concert came from Mr. Winfield, who was desirous of acknowledging in a tangible way the hospitality of the town. No doubt the workers at Cambridge will take this leaf out of Cheltenham's book.

The Friday of Conference Week is the day wholly given over to excursions. The morning was delightful, and a large party set out immediately after breakfast for Worcester. The 'Faithful City' was reached in time for morning service at the Cathedral. At its conclusion Mr. Ivor Atkins was good enough to render a charming selection of organ music. Canon Teignmouth-Shore and Dean Forrest were splendid guides to the history and beauty of the venerable pile. The tomb of King John and the Chantry of Prince Arthur attracted much attention, and the Canon and the Dean had to find answers to a perfect volley of questions from the representatives present. I am sure the courteous and kindly clergymen who did the honours will be much gratified when they learn that their remarks will go to vivify many a history lesson in all parts of the country.

A visit to the china works, a stroll about the old-world streets and a capital lunch filled up the time until the brakes were ready to convey the party to Madresfield Court.

It is impossible to do justice to the grace and hospitality of Earl Beauchamp. At the reception of the purses on Thursday he found an occasion for inviting the whole of the representatives to visit his beautiful seat on the next day. The invitation was most popular. Over five hundred representatives left Cheltenham at one o'clock by special train for Malvern. Brakes were in waiting to convey the party to the Court. The Earl and Lady Mary Lygon received the guests with a cordiality that, no doubt, owed more to real generosity of nature than to 'noblesse oblige.' An illustrated souvenir was presented to each guest, and it is worthy of notice as showing the interest his Lordship took in the arrangements, that the letterpress is from his own pen. The gardens are the glory of Madresfield Court, and, though the biting winds of March have played havoc with the flowers, the wonderful triangle of cedar avenues, the rocks, the lawns and the park were found to be full of charm. The moated house, with its quaint aggregation of old and new, was an important outpost of Worcester during the Civil Wars. The place with its treasures of pictures, books and porcelain was thrown open for the inspection of all, and the Earl and Lady Lygon showed the utmost solicitude for the entertainment of their guests. There was tea in a large marquee by the side of the moat, and afterwards, Mr. Waddington, Mr. Addiscott and Mr. Wheeler conveyed our thanks to Earl Beauchamp in most graceful fashion. His Lordship, who had moved bare headed among his guests all day, responded with a charming sincerity that reconciled even a fierce old Radical like myself to the House of Lords.

Smart showers of rain made the drive to the station uncomfortable. It will, I think, take much rain and many years to obliterate the memory of such noble and gracious hospitality. A ladies' concert at the Imperial Rooms wound up a most pleasing day.

A small party on the same day made a circular tour to Tewkesbury, thence by steamer to Gloucester, and home by train to Cheltenham. The timbered houses, the quaint streets, and above all Tewkesbury Abbey, with its noble Norman arch and Milton's organ called for the delighted admiration of the visitors. Leaving the scene of the Yorkist victory, and of 'John Halifax, Gentleman,' the river voyage of two hours was not a moment too long. Arrived at Gloucester, the party proceeded to the peerless Cathedral, where the Dean was in waiting to point out its glories. The wonderful east window, the largest in England, the bog-oak effigy of Robert of Normandy, the exquisite canopied shrine of Edward II., and Flaxman's immortal group all received their meed of attention. A smaller party of Shakesperean enthusiasts spent a halcyon day in Stratford-on-Avon.

On Saturday, the drive to Winchcombe was repeated with an extension to the sweet old English village of Broadway. Nothing could surpass the artistic beauty of the place, with its old thatched cottages, its gabled houses, its village green, its tender suggestions of peace and rest. Many a worker in back city streets will carry its fragrant memory back with him to solace the dark hours of weariness and defeat.

The Cheltenham Conference will be memorable on its business side for the fearless courage of the Presidential address, the revolt of the Church teachers, and the reversal of the Brighton position on the constitution of the educational

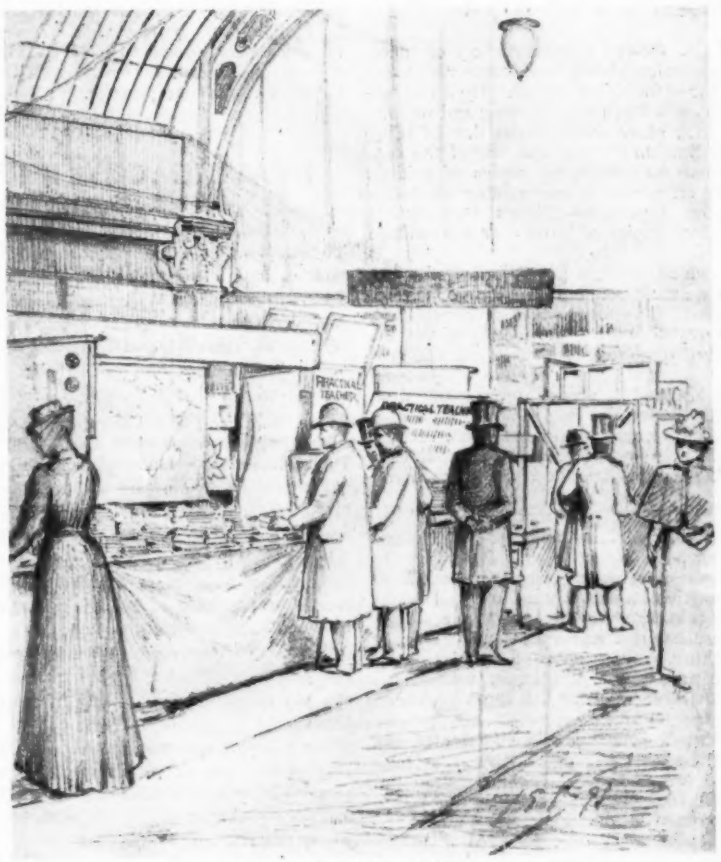
Sudeley Castle.

authority. But it will be no less memorable on the recreative side for the series of delightful tours, planned with admirable skill and foresight and carried through with an amount of care and kindly attention for the comfort of individuals which I do not remember to have been surpassed elsewhere.

THE PUBLISHERS' EXHIBITION.

'A GREAT OBJECT LESSON FOR TEACHERS.'

RARELY, if ever before, has the Publishers' Exhibition been so varied, so attractive, so distinctive, so significant as that just held in connection with the Cheltenham Conference. The southern limb of the great cruciform glasshouse known as the Winter Gardens was devoted to the purposes of the Exhibition, and this large rectangular space was divided by the ranges of exhibitors' stalls into four longitudinal aisles. The limitations of space imposed on the exhibitors caused the exhibition to be unusually compact, while the variety already referred to made it unusually comprehensive. The stormy and uncertain weather which prevailed during the greater part of the week occasioned frequent thronging of the somewhat narrow aisles by visitors and representatives, who were fain to keep under shelter. The rain had the further compensatory advantage of tempering the heat and the glare which one is sure to experience under a glass roof through which the unclouded sun pours down its rays.



A Stall in the Publishers' Exhibition.

Through the arrangement of exhibits as we have described it is not easy to get a general view of the whole from any one standpoint, and there is no gallery whence a bird's eye view may be obtained. Nevertheless a hasty glance round soon results in an impression which more detailed examination of the exhibition only serves to confirm and deepen, namely, that the most distinctive characteristic of the whole is that it is a reflex of the change which has recently come over our educational system. The pictorial illustrations to be seen on every hand, the various collections of objects, the apparatus for conducting experiments, the mechanical appliances for demonstrating scientific principles, all help to show how quickly the publishers have responded to the growing idea that education needs to become less bookish, less abstract, more practical, more real, more attractive. The plan of training the powers of observation and reasoning by exercising the senses in examining actual things, that is, by object teaching, has become thoroughly popular; and here we have in this entire exhibition a great 'object lesson for teachers,' on the best and most practical methods of teaching,—teaching through things or pictures rather than books or words.

It must not, however, be supposed that books are wanting in the exhibition. A few special firms show scarcely anything but books, but these are worthy of note as exceptional. George Bell and Sons, William Blackwood, Longmans, Macmillans, Sampson Low and Co., Sir Isaac Pitman and Son, still exhibit their many respective series of literary, historical, geographical, and scientific reading books, and also their text books and class books for advanced students. But the books appear to be thrown somewhat in the shade by the bright pictures, diagrams, charts, maps, models and apparatus which abound on other stalls.

We may refer also to the long ranges of classical texts and of text books of history, literature, and science which Messrs. Clive, of the University College Press, have produced to assist University students in preparing for their examinations. During the few years this Press has been in existence nearly four hundred volumes have issued from it, and the present rate of out-put is about one volume per week. Of the practically uniform suitability of these works for the purpose we have frequently had to speak in our review columns. The longer established Cambridge University Press, in its various series of Bible textbooks, classics, modern language texts, manuals of history and science, gives ample evidence of a similar degree of activity.

Messrs. Sampson Low and Co. make a striking display of prize volumes, prominent among them being very cheap crown octavo editions of Jules Verne's works, with the same illustrations as appeared in the original expensive editions.

Messrs. Cassell and Co., W. and R. Chambers, Collins, Sons and Co., George Gill and Sons, T. Nelson and Sons, and other firms add maps and pictorial illustrations to their numerous excellent modern reading and text books. We should especially commend the delicately artistic floral pictures of Edward Arnold, of Griffith and Farran, and of Blackie and Son. The last named exhibit the prize water-colour reproductions of some of their published copies.

The stall of McDougall's Educational Company contained a great variety of school publications, and was distinguished by one of a most noteworthy kind—a most elegantly designed 'Regular Attendance Record,' which would form an admirable decoration for any schoolroom.

Turning our attention now to the stalls, which are marked by the most striking variety and novelty, we cannot do better than begin alphabetically with E. J. Arnold and Son, of Leeds. A considerable portion of the western wall is occupied by their splendid series of large photographs and their brilliant selection of framed coloured photographs, on which we have commented in our articles on 'Art Pictures for School Room Walls.' Here we need do no more than call attention to the wide field

of choice which these beautiful pictures afford. The Illustrated Catalogue of them is itself a work of art. At the same stall we find three cabinets of specimens to illustrate object-teaching: one contains sixty-three *Minerals*, the second more than one hundred objects illustrative of *Textiles*, and the third one hundred and thirty-five illustrative miscellaneous *Natural Products*. The objects have been arranged by Mr. Alfonzo Gardiner, on what appears to be a perfectly reasonable and orderly system, and the value of such collections in school can hardly be over-estimated. A relief map of South Wales—the relief being shown to scale—attracted our notice at the same stall; as also did some substantially-made simple Tellurians for illustrating astronomical phenomena, a number of well-arranged objects for infant classes, and a clever contrivance for the rapid sharpening of slate pencils.

The Educational Supply Association exhibits showed a similar variety, and included large photographs, plain and coloured, cabinets of objects, maps, and nearly every kind of school appliance.

G. W. Bacon and Co. showed a great variety of maps, atlases, drawing demonstration sheets, and some very tastefully-designed new pictures for object lessons. On an adjoining stall were shown Woolf's Pencils for drawing and writing, which, in addition to their other merits, claim that of being made in London; and Zuccato's Typograph, one of the best known of the instruments for multiplying copies of writings and drawings. Not far off was to be seen another admirably simple manifold copying apparatus—Ellam's Duplicator—which will rapidly produce copies of written or type-written matter.

Amongst the firms which made a large display of maps, pictures, and diagrams, we must not omit to name A. Johnston and Geo. Philip and Sons. The former had a very effective series of coloured pictures illustrating the history of civilization, and the latter showed specimens of Holzel's splendid geographical pictures.

At the stall of the Midland Educational Company were shown the 'Methodical Model Drawing Charts,' which, so far as a hasty examination could be depended on, seemed likely to be a valuable help in teaching a rather difficult branch of drawing. A Hand-book to accompany the charts is also published.

Close by, Messrs. L. and C. Hardtmuth exhibited an extensive assortment of pencils, including one of excellent quality—the 'Koh-i-noor pencil.'

Certain exhibitors confined themselves largely or entirely to a particular class of educational aids. Thus, Messrs. Trought and Cheshire, showed specimens, especially of natural products, for object teaching, and Chapman and Hall displayed works especially on Art Teaching, with samples of Art Casts produced by the Gelatine process, and Plasticene, a substance recommended instead of clay for modelling. These have been already described in our pages.

Curwen and Sons and Novello and Co. represented the Musical element in school work.

One Cheltenham and two or three London firms showed pianos, for which the demand in schools is likely to increase with the new developments of education.

Newmann and Co., Charles and Dible, exhibited a remarkable collection of helps to Kindergarten teaching and the varied occupations which have sprung from it. A. Brown and Son, of Hull, and Moffatt and Paige showed many similar helps, with others of a more miscellaneous kind.

C. Arthur Pearson, Limited, showed samples of the very useful and economical double school maps invented by Mr. Grayston, and also some framed sets of charming coloured illustrations reminiscent of Miss Kate Greenaway, and intended to give point and force to the title of a new series of 'Attractive Readers.'

The National Publishing and Supply Association, of Reading, showed a number of school appliances, including a Fractional Globe, and apparatus for teaching Solid Geometry.

On the stall of the Religious Tract Society were many books suitable for prizes and presents, and a numerous series of effective coloured Scripture cartoons. Another series of coloured Bible pictures was shown by the National Society, who had a considerable show of school books.

Miss Lambert showed her admirable invention, the Demonstration Frame for the Class-teaching of Needlework. Mr. Armitage, of Sheffield, exhibited a set of tools for Sloyd and Woodwork, and Mr. Towers, of Portsmouth, kept up the constant click-click of his ingenious invention for teaching spelling and word building.

It would be a needless affectation of modesty if we neglected to mention that at one stall appeared the PRACTICAL TEACHER and its offspring, the PRACTICAL TEACHER'S ART MONTHLY, both of which were very frequently the subjects of cordial commendation. Specimens were to be seen also of the carefully-prepared and useful supplements issued with the Journal, and of the Royal Portfolios from which most of them are selected. Our illustrated souvenir of the Cheltenham Conference was gratefully received by hundreds of the members and visitors.

From this account of the Publishers' Exhibition, in which we have endeavoured to avoid the dulness of a mere catalogue, we hope our readers who were not present may be able to form a fairly correct idea of what it was like, and to recognise that it deserved to be called, as we observed before, a great object-lesson for teachers on the most recent developments of educational practice.

LEAVING CERTIFICATE, 1898.

Circular 218.

To many of the readers of this Magazine the most important sentence in this Circular is: 'Pupil Teachers engaged in a State-aided school may also be admitted to the examination.' There is evidently a desire now on the part of the Department that this privilege should be taken advantage of; but, so long as candidates qualified in this way are so peculiarly dealt with by the Department in connection with the Training Colleges, the Leaving Certificate will never have the place it deserves in the Pupil Teacher system. The present option between this examination and the ordinary Pupil Teacher Examination is meant to allow clever Pupil Teachers to avoid the dreary drudgery of the ordinary course. What is to hinder *all* Pupil Teachers being required to take the Leaving Certificate Examination in certain subjects? The present very unsatisfactory Pupil Teacher Examination could then be altogether abolished, and the more technical matters, such as Teaching, Needlework, Reading, Penmanship, could be attended to at the Inspector's annual visit.

A warning is given against presenting pupils in too high a stage: and to prevent this a hint is given that henceforth it will be less easy to gain a lower Certificate by doing inferior work for a higher Certificate.

The following sentence explains itself, and is very important to some of our readers: 'While my Lords are unable to hold any examination at or in connection with a school from which candidates are presented only in Arithmetic and English of the lower grade, this rule will not preclude pupils of a school from being presented in these subjects only, in cases where some of the candidates are presented in one or more of the higher subjects of education and where my Lords have agreed to hold an examination.'

The Department still leave the selection of the candidates to be presented entirely in the hands of the school authorities; but an exceedingly broad hint is given that the whole of the highest class, or the two highest classes, should be presented 'if the examination is to serve as a test of the real merits of a school.'

☞ The concluding Paper of our Cheltenham Conference Section, entitled

'AN ARTISTIC PILGRIMAGE,'

is unavoidably crowded out, and will appear next month.

EDUCATION IN ENGLAND.

N.U.T. NOTES, &c.

BY T. B. ELLERY, F.R.G.S.,
1895-6 *President of the National Union of Teachers,*
Chairman of the Teachers' Benevolent Committee.

The Aycliffe Diamond Jubilee School. The N.U.T has done many excellent things, but I question if it has ever done anything so thoroughly practical as the building of the new schools at Aycliffe. I question, too, if it has ever been in such deadly earnest as it has been in this matter. The vicar of the parish has been convinced at last that the protection of the N.U.T. is no sham; the new building in which Mr. Thompson is now carrying on his work will always be sufficient evidence of this. Personally, I am delighted at the result of the battle. In my Presidential Address (Manchester 1895) I referred to Mr. Eade's action in dismissing a teacher of whose work a former vicar (Mr. Eade's father by the way) spoke in terms of highest praise. It has taken just three years to do complete justice to Mr. Thompson; first one step having been taken, and then another, in order to bring about a settlement satisfactory to both parties. But as nothing short of Mr. Thompson's reinstatement would satisfy the N.U.T., and as Mr. Eade very unwisely and most ungenerously refused this measure of fair play, the question of a new school was at last considered; and now a handsome and thoroughly up-to-date building, in which the children of the people may be educated, stands in Aycliffe, a testimony to the popularity of the teacher and to the 'grit' of the villagers and their supporters.

A Red Letter Day. Thanks to Mr. George Chapman, the difficulty of obtaining a site was soon removed. Willing hands were at once engaged in voluntary brickleading, &c., hearts and pockets were opened, and the sum that remains to be raised amounts to only £200. I have sufficient faith in the men and women of the north, and in the members of the N.U.T., to believe that the Aycliffe Diamond Jubilee School will soon be out of debt. It was my privilege to be present at the meeting which followed the opening ceremony, in company with the President of the Union, Mr. C. J. Addiscott, Mr. J. H. Yoxall, M.P., and Mr. T. A. Organ, B.A., L.C.C., and to say a few words as a churchman in support of the church school teacher who has been so badly treated. It was evident that the great company assembled meant 'business'—uncompromising support of Mr. Thompson against the vicar of the parish. Men of the stamp of Mr. Chapman, Mr. Garry, Mr. Nicholson, and Mr. Scott, having once put their hands to the plough never look back. It was quite a pleasure to listen to the vigorous speech of Mr. Nicholson (the correspondent), and to the applause with which his remarks were received. The villagers will not soon forget the proceedings of that day—the formal opening of the school doors by Miss Chapman, a silver key being presented to her for that purpose—the tea, the public meeting, and the dance. In spite of the snow, which kept many away who would otherwise have been present, the rooms were crowded, and the managers must have been delighted with the great success which attended their efforts. 120 children, out of the 150 or 160 in the village, attend the Diamond Jubilee School, and those who live on the spot are confident that ere long the vicar will be relieved of practically all responsibility in the matter of the education of the children of the parish. Under all the circumstances, so mote it be.

The Cheltenham Conference. One's first words must be those of congratulation to the Cheltenham teachers upon the great success of the week's proceedings. The difficulties in the way of providing a suitable room in which to hold the meeting were insurmountable, and I fear that in this respect the Cheltenham Conference was more or less a failure. As Dr. Macnamara put it, the Conference-room itself was little more than an annexe of the Publishers' Exhibition, and those who were present will agree that 'Mac' in no way exaggerated the position. Still, the local people did the best they could. There was no other hall large enough for the purpose, and therefore it was the Winter Gardens or nothing! Apart from this, everything was completely satisfactory from start to finish. From a *social* point of view, we have probably never had so enjoyable a week, great as has been the success in former years. The Ball, the Mayor's Reception, the Masonic Gathering, the various Smoking Concerts, the Excursions—to mention a few of the many good things provided—will long be remembered by the 1898 Cheltenham Conference representatives. I can well remember the first Cheltenham Conference, with the address of welcome from the Voluntary School Managers. The local teachers on that occasion did splendidly. The genial Frank Wheeler was the general secretary then. Now, after a lapse of ten years, he has accepted the same post, and has succeeded, I should say, even beyond the measure of his expectation!

Other pens will write in these columns of the doings of the week. I must therefore be brief,—so brief, in fact, that many important events cannot receive even passing mention.

The President's Address. My readers will expect a word or two from me on this subject. I must say at once that, though it cannot compare with Mr. Pope's masterly effort of 1888 in the same town, the President's Address was evidently carefully prepared, and if strong language and vigorous attack count for anything, it was a decided success. Mr. Waddington has done so much for the 'child-slave' of the North, that anything he says on the subject of 'Half-time' deserves to receive respectful attention. Once more he has made out an unanswerable case. His indictment of the Oldham operatives, who are able to save £150,000 a year to spend in the annual Wakes, and yet sacrifice the future of their offspring for the weekly half-crown which the little ones are able to bring home, was brave and manly. The President wishes to see the bad, barbarous, and totally unncessary half-time system abolished. We are all with him, and I trust he will have during his year of office some reward for his past labours.

I am sorry Mr. Waddington felt it necessary to make such a strong attack upon the denominational school system. It was, in my judgment, unnecessary. We all join with him in condemning abuses, we all desire reforms, but we should always be ready to give credit where credit is due. The impression has gone abroad that the President is in favour of Universal School Boards. I don't think he is. He is in favour of a National System, it is true; but he would be sorry, I believe, to see an extension of the present School Board system, with all the evil of small areas, &c., &c.

The President on the Dual System. From what I have already said, it will be seen that I cannot say Amen to everything in the Address. I do not believe that anything would have been lost by a generous acknowledgment of the fact that thousands of Churchmen are really sincerely interested, and interested from the best of motives, in the maintenance of the Voluntary School system. Nor do I think that anything is gained by 'putting up the backs' of those who dip their hands into their pockets, and who are in so many cases the friends of the teachers. The 'theologian' is not necessarily the enemy of real education. The best friend of education and of the teacher I ever knew was one of Mr. Waddington's 'theologians.' I am quite sure the President meant to be fair. That does not prevent me from saying that I wish he had combined with his vigorous attack, the acknowledgment to which I have referred. Viscount Cross has charged him with a desire to see religious education abolished in our schools, which only proves that his Lordship has not carefully read Mr. Waddington's address. Naturally the Press is divided, the Unionist papers being extremely angry, and the Radical and 'Progressive' papers delighted! But even the *Standard* might have given Mr. Waddington full credit for his manly exposure of the half-time system.

Congratulation to Mr. Clancy the New Vice-President. In a former number I stated that Mr. Clancy's success was practically assured. Few of us, however, were prepared for the magnificent majority with which he was honoured. He had to fight against odds, here and there he had to fight against religious prejudices, but his work and his ability have been recognised in truly handsome fashion, and I now congratulate him, not only in my own name, but also—for I believe I may do so—on behalf of the readers of this Journal.

May he have health and strength worthily to perform the duties devolving upon him!

Owing to pressure on space, several paragraphs of Mr. Ellery's 'Notes' have been held over till next issue.

EDUCATION IN SCOTLAND.

E.I.S. NOTES, &c.

BY JAS. PATERSON,
Vice-President of the Educational Institute of Scotland.

Bursaries going a-begging. At the inquiry held in Edinburgh by the Educational Institute's Commission on Secondary Education, Mr. Arnot, Clerk to the Edinburgh School Board, was the principal witness examined, and he furnished much valuable information. On the question of bursaries, Mr. Arnot spoke very strongly. He is of opinion that the bursary system, so far at least as the Edinburgh district is concerned, is utterly overdone; in fact the bursaries were so numerous that they were actually going a-begging. In proof of his assertion he stated that on a recent occasion, where two Robertson bursaries of £25 each for six years were vacant, only one candidate came forward after extensive advertising. He thought that the subject should be brought more into prominence at the public meetings, where he was of opinion they had too much of the statistical element, too much talk of grant and rates, and too little about education. Regarding school examinations he thought they were a great curse, and his remedy was to do away with them, and have a fixed payment per head.

Dr. Macnamara on Scottish Education. The 'At Home' of the Edinburgh branch of the E.I.S. in honour of Mr. T. J. Macnamara, LL.D., was a great success. In the course of a lengthy address, Dr. Macnamara said that, on looking back on the records of the last fifty years, he was struck with the advancement of the position of the elementary school teacher as being one of the great features of the educational movement in Great Britain. By means of copious quotations from Blue-books he was able to draw an interesting picture of the teacher of that period, as well as to point out the curiosities of the system of training him for the 'modest respectability of his lot.' He cautioned the Scottish people against resting on the historic past of their educational system, and pointed to the rapid strides being made in England, and more especially in Wales, as proofs of the necessity for Scotland continuing to move forward if she wishes to keep in the van. In speaking of the unsatisfactory position of the teacher under small school boards he advocated the extension of School Board areas. Dr. Macnamara concluded his interesting and elegant address with an exhortation to teachers to combine by becoming members of the Institute.

Glasgow branch E.I.S. At the March meeting of the Glasgow branch of the E.I.S., Mr. Highet Wilson, teacher of drawing in the Pupil's Teacher' Institute, Glasgow, read a paper on 'The Teaching of Drawing in Elementary Schools.' The lecturer dwelt chiefly on a few of the difficulties which confronted the teacher of drawing in an elementary school. The first and greatest difficulty seemed to be to earn the award 'Excellent.' In his view the demands of the drawing schedule were excessive for pupils so young, and the methods of examination were open to criticism. It may be noted in this connection that the highest award under the new Code is very good; and it is to be hoped that this evident lowering of the standard will lead to the highest award being more frequently gained.

S.A.T.A. The Scottish Assistant Teachers' Association have drawn up a model scheme of salaries which has been submitted to School Boards. In a letter accompanying the scheme the opinion is expressed that the adoption of such schemes by the various localities indicated would remove many of the difficulties experienced by School Boards in providing their schools with a capable and loyal staff. Quotations from the reports of H.M. Inspectors are given to show that the inducements to enter the teaching profession have in the meantime ceased to attract a sufficient number of youths of ability. This condition of affairs, the letter states, is mainly due to the following causes:—(*a*) The qualifications of the teacher are gradually being raised; and (*b*) Few School Boards have a definite scheme of salaries rising by fixed annual increments to a satisfactory maximum.

Drawing under the New Code. In incorporating Drawing in the Code along with other school subjects, their Lordships express their desire not only to promote unity of school work, but to obviate any unnecessary multiplicity of examinations and of school returns. They hope that it may ultimately be found possible in all cases to have drawing inspected along with other subjects of school instruction, but for the present it may be necessary from time to time to supplement the ordinary examinations of the school by special drawing inspection.

Article * 141 of the New Code. In regard to the manual occupations necessary to earn the additional grant under Article * 141 of the New Code, the following principles have been laid down by the Scotch Education Department:—(1) The occupations in each standard should be according to a continuous scheme, progressing in difficulty from the Kindergarten occupations of the infant school; (2) The pupil should not be aided in any way by the teacher in the actual execution of the work, and, though general methods of work must necessarily be shown, simple problems should be set from time to time to be solved by the pupils from their own resources; (3) Other things being equal, those occupations should be selected which can be conducted in the ordinary class-room, and with the minimum of special apparatus; (4) It should be steadily borne in mind that the most important object of these exercises is not the production of a certain amount of work, however well executed, but the mental discipline of the pupils through occupations in which they are interested.

Mull, Morven, and Iona Branch E.I.S. At the spring meeting of the Mull, Morven and Iona branch of the E.I.S. Mr. Walter, Tobermory, delivered an address on 'Elementary Science Teaching.' He sketched the course of a practical elementary lesson in chemistry, and exemplified his subject by the preparation of hydrogen, pointing out the precautions necessary in its preparation, with its chief properties. The consideration of the theoretical part of the subject was postponed till next meeting.

Presentation to Mr. Innes, late of Fordyce. An interesting ceremony took place lately at Fordyce, when Mr. Innes, the former headmaster of the public school, who was recently dismissed by the School Board—under circumstances now tolerably familiar to the general public—was presented, at a large assemblage of his friends in the parish, with an illuminated address from the bursars and pupils of the school, and a massive silver salver from a number of the parishioners and of his friends in the district, Mrs. Innes being at the same time the recipient of a beautiful gold brooch. Despite the rainy evening, the large room of the school in which the presentation was made was crammed, and it was apparent from the enthusiasm that prevailed that Mr. Innes has still a host of friends in Fordyce. As showing the feeling of the subscribers in regard to the question of the dismissal, the following sentence from the address may be quoted:—'We, the undersigned, deplore the result the Fordyce School Board has arrived at in dismissing Mr. Innes from his position as headmaster in Fordyce Public School; and we testify our respect for, and unabated confidence in, Mr. Innes as a thorough, sound, and courteous teacher.'

Elementary *v.* Secondary Education. A joint meeting of the Aberdeen branches of the Secondary Teachers' Association and the Educational Institute of Scotland was held lately in the Grammar School, at which the relation of primary to secondary teaching was the subject of consideration. Mr. Adams read a paper on 'The Point of Divergence between Primary and Secondary Work,' concluding with the following propositions:—(1) Those going to the University should go to a secondary school not later than after passing Standard VI., and, if possible, on entry to Standard V.; (2) Those having only two years after Standard VI. should not go to a secondary school at all, but should remain in their primary school, getting an ex-Standard course that will be complete as far as it goes, or go for the final two years to an ex-Standard school; (3) Elementary schools in towns should not attempt secondary work leading up to the University. Mr. Morland Simpson, Rector of the Grammar School, followed with a paper on 'What the Secondary School gets from the Primary,' in which he suggested that it would be an immense gain all round if means could be devised whereby at a certain stage *bonâ fide* candidates for secondary education should be required to leave the purely elementary school for one specially organised for the purpose.

EDUCATION ABROAD.

BY E. E. FOURNIER D'ALBE, B.SC., A.R.C.S.

EARLY marriages of teachers are discouraged in the Grand Duchy of Hessen. The education office of that little German country has decreed that henceforth no married teacher shall be given precedence over an unmarried teacher in the matter of promotion. The German teacher is not a very marrying man as it is, but probably the higher birth-rate of the German people has precluded the alarm with which a similar enactment would be received in France.

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THE practice of the pupils greeting their teachers by kissing their hands has been abolished in Buda-Pest. Such abolition is, no doubt, quite right and proper from a sanitary point of view, and also as regards general educational considerations. But it seems a pity that that picturesque ceremony should be practically relegated to Royal drawing-rooms and receptions. Among the German and Austrian aristocracy the custom still holds its own, more especially in greetings between older and younger people. While it lasts the age of chivalry cannot be pronounced quite dead.

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IT appears that the German Education Department will not be represented at the Paris Exhibition of 1900. This seems somewhat extraordinary when we remember the German claims for supremacy in matters educational. The educational budget has increased five-fold since 1871, and this year it outstrips all previous records. Besides, the Hamburg exhibition of educational implements was a great success. It seems very likely that the Swiss exhibit will carry off the palm in this department of the *Exposition Universelle.*

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A CURIOUS struggle is going on in Berne. The official organ of the Bernese teachers is the *Bernische Schulblatt.* To counteract its influence, Herr Gobat, the director of education, has started the *Amtliche Schulblatt*, and the teachers are planning to boycott all the business houses which advertise in the Government paper, in order to bring it to its knees!

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THE *Praktische Schulmann* contains a 'grammatico-etymological sketch' on the subject of the gender of the sun and moon. While all the Græco-Latin and the English languages make the sun masculine and the moon feminine, the German language says *die Sonne* and *der Mond.* This peculiarity is shared by the Celtic languages, but in Irish the moon is spoken of in both genders. The essayist, Dr. Zierow, traces the genders down to the early days of German literature, and finds that the genders were in Old German distributed in accordance with the Græco-Latin practice. Whence the change? It is certainly not to be sought in learned quarters, since the German language was not cultivated in the literary sense before the change set in. The writer endeavours to trace the psychological growth of the feminine idea as attached to the sun, the source of gladness and fruitfulness. He even argues the superiority of the German feminine ideal from the choice of the gender. This conclusion will doubtless delight the hearts of Welshmen.

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THE *Journal de l'Enseignement Primaire* contains a vigorous criticism of the supposed benefit derived by the teacher from a year's service in the army. The correspondent maintains that the young soldier-teacher suffers under the mechanical drills with the colours, and adds:

> 'J'irai plus loin, et je dirai que le régiment a une influence néfaste sur le développment de l'intelligence, par ses règlements qui prévoient tout et empêchent toute initiative, par une discipline de fer qui ordonne d'agir sans réflexion, sans observation, et surtout par la façon brutale dont elle est appliquée. L'être actif qui existe en nous n'est pas respecté. C'est ce qui fait qu'*on se plie* à la discipline, mais qu'*on s'y fait pas.* Rien que cette raison suffirait d'ailleurs pour ramener l'instituteur soldat à la profession qu'il a embrassée librement.
>
> 'Aussi le résultat est-il facile à prévoir: Quand l'instituteur revient du régiment, son bagage littéraire et scientifique est bien allégé. Et notez que les instituteurs ne sont pas seuls dans ce cas; bien des étudiants m'ont avoué avoir fait sur eux-mêmes une constatation identique.'

At the same time, the regulations on the same subject in the German army have been made more rigorous, and it is only by very exceptional conduct that the teacher can obtain any advantage over the peasant-boy.

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IN the *Indian Journal of Education*, W. E. Hoare, M.A., pleads for a radical reform in the system of teaching the Indian vernacular languages at high schools and Universities. First of all, he wants to abolish the learned pundit:

> 'We all know the pundit or munshi. Here he comes, more or less punctually, a grey venerable gentleman, between whom and the European principal there is usually a great gulf fixed, that of language. The munshi takes his seat in a corner of the big hall, his boys sit round him, literally round his knees, bending forward. The lesson seems to require a great deal of reading and sonorous ha-ha-ing. The boys as a rule behave well, but it need hardly be said that our friend is quite ignorant of the principles of pedagogy. As he learnt, so he transmits. I have already said that I propose to replace him in First Grade colleges by graduates who have taken a degree in Oriental study. . . . . We now come to the thorny question of the vernaculars themselves, and their position as subjects of study. It is obvious that the first thing we must do must be to differentiate them, though in talking of the value of the vernaculars everybody seems to lump them together. No doubt every vernacular may be made an instrument of intellectual drill.'

But the mistake lies in the placing Sanskrit or Pali on a level with Uriya. As regards the text-books used in the pundit classes, they are, says the writer, badly printed and full of typographical errors, and the English translations of the native literature are puzzling even to the Englishman. He gives some samples:—

> '"He, thinking of whom with an exclusively absorbed soul thou dost not know me, wealthy in penance, to have arrived here, (he) will not remember thee even being reminded, as an intoxicated person does not remember the talk made before." And again, "Charioteer, we have been drawn very far away by the antelope there. And even yet, with the eyes repeatedly cast on the chariot pursuing him, so gracefully (thus appearing graceful) on account of the bending of his neck, entering as much as possible (for the most part) into the fore-part of his body by (contracting) the hinder half through fear of the descent of the arrow, strewing his path with the half-chewed Darbha-grass dropping from his mouth open on account of exhaustion, look! by reason of his lofty boundings, he flies more into the skies than along the ground. How then (is it that) he can be seen with difficulty by me yet pursuing him?" It would be interesting to know if stuff of this is anywhere accepted by examiners as a satisfactory translation of an admittedly fine play.'

* * * * * *

AN extraordinary occurrence is reported from Bulgaria. Last summer, Professor Jordan, of the Government high school at Küprülü, took his pupils out for a botanical excursion. One of the pupils was the son of the richest merchant in the town. The party were surprised by brigands, who carried off the merchant's son and only restored him on payment of a large ransom. Some of the brigands were subsequently arrested and tried, and then it turned out that the professor was in league with the band, and had arranged the excursion on purpose.

OUR FRENCH AND GERMAN PRIZE COMPETITIONS WILL BE RESUMED NEXT MONTH.

OUR CLASS ROOM AIDS

NOTES OF A LESSON ON A RIVER.

By WILLIAM DONE, B.A., *Head Master of Brighton Pupil Teacher School.*

SEE SUPPLEMENT PRESENTED WITH THIS NUMBER.

HEADS.	MATTER AND METHOD.
I. *Formation of a River.*	Ask what becomes of the rain which falls. Some of it sinks into the ground, some of it is drained into the ditches and streams, some of it is dried up, or as we say, is evaporated. If any child has seen and noticed a river, let him contrast the water, as regards motion, in a pond with that in a river. The water in the latter is always moving. It moves from higher to lower ground. Illustrate by water running down a slate. We say that a river has a current.
II. *Current.*	
III. *The volume increases from the source to the mouth.*	Let them observe the general view of the river as shown in the diagram. Notice that the width of the stream increases as it flows along. A few questions as they look at the diagram will elicit that this increase in volume is due to the water poured into the river by smaller streams during its course. These we call tributaries.
IV. *Tributaries.*	Summing up then the facts we have observed, we place upon the black-board the results. A river is a stream of water flowing over sloping land and generally reaching the sea.
V. *More details as to the source of a River.*	Call attention to the picture of a Glacier. Snow constantly falling and getting wedged tightly between the mountain sides and pressed down by further falls of snow will turn into ice. Recall to their minds the fact of tightly squeezing snow-balls in their hands. This mass of ice then pressed from above and at the sides, very slowly moves down the slope. As its end comes into warmer regions it thaws and begins to form a stream of water. Here then is one way in which a river may have its source. The rivers Rhine and Rhone are noteworthy examples.
(1). Glacier.	
(2). Spring.	Let them look at the picture of the spring. The falling rain has percolated through the soft earth until it has reached ground that it could not sink through. Illustrate by means of sand and clay. The water collecting on such ground, as it could not penetrate, would flow along until perhaps it came to a break, such as the side of a hill would make, whence it would issue as a spring, and thus act as the source of a river.
VI. *The banks and the bed of a River.*	Question as to what keeps the water in the river from running over the land at the sides. What are these banks made of? Does a river ever overflow its banks? What happens then?
VII. *A Waterfall.*	The ground where the water lies is called the bed of the river. Suppose the bed of the river suddenly drops in one place. Illustrate by pouring water down the slope of the desk and letting it fall over on to the floor. Show the picture of the waterfall.
IX. *Depth.*	From what the children have heard of London and the Thames, they will be able to tell that ships can pass up large rivers some distance, but farther up we see barges are the largest vehicles. We therefore elicit that the water increases in depth as the river flows along.
X. *River-port.*	Call attention, both in the map and general picture, to the large town depicted near the mouth of the stream. Evidently ships can reach this, until stopped by the bridge which spans the river. A town situated thus is called a River-Port; compare with Sea-Port.
XI. *The formation of a Delta.*	Can we see to the bottom of a river? In places we might do so, but not near the mouth, because the water, besides being deep, is muddy. What makes it muddy? It has washed the soil from its bed. The swifter the current, and the greater the volume, the more material will be carried along by the stream. By mixing similar materials in a glass bowl, show that this suspended matter will subside, if the mixture is allowed to stand still. Apply this to what takes place in a river. The stream getting so much wider, the current is slower and the suspended matters are deposited; of course the heaviest materials first; hence in time, pieces of land, roughly triangular in shape, are formed at the mouth of the river. Examine picture and map.
XII. *River Basin.*	From a careful examination of the picture, it will be seen that the area which is drained by a river and its tributaries is separated from similar areas by rising ground. Give the terms River-basin, and Water-shed, or Water-parting.
XIV. *Water-shed.*	
XV. *Lake.*	Make a small model in clay or sand, and show that, owing to a wide shallow depression, the bed of a river may broaden out and form a lake. Elicit that the current will be slower than in the ordinary bed of the stream. Elicit also from above that deposits will be formed.
XVI. *Uses of Rivers.*	Rivers are great natural roads. Ships and other boats of all sizes pass along, carrying people and goods. Along its banks trades are carried on. Question as to the situation of many great European capitals. They are placed on the banks of rivers. The water of rivers, when purified, is used for drinking. Rivers, again, are in themselves beautiful, and lend themselves to recreative purposes. The fish caught in the water constitute a food supply.
Recapitulation.	Examine briefly the various points of the lesson, and jot heads of answers on the black-board.

NOTES OF LESSONS ON ICE AND AIR.

By WILLIAM DONE, B.A., *Head Master of Brighton Pupil Teacher School.*

☞ ***A full page of specially prepared, White on Black, Blackboard Illustrations, by C. Armstrong, City of London School of Art, and Examiner to Science and Art Department, to suit the following Object Lessons, appears in the May Number of the PRACTICAL TEACHER'S ART MONTHLY. Now ready, Price Twopence.***

I. ICE.

Articles of Illustration—Some ice, thermometer, freezing mixture, flasks, thin glass tubing, diagram of snow crystals.

EXPERIMENTS.	INFERENCES.
I. *To show the distinguishing qualities.*	
(*a*) Let a child hold a piece of ice in one hand and a piece of chalk or similar material in the other.	(*a*) Ice feels cold.
(*b*) Compare the colour with that of water, and with that of other objects in the room.	(*b*) Ice is colourless.
(*c*) Chip a thin piece off the block and place it over some printed letters. Pound some down. Scratch a piece.	(*c*) It is transparent, but appears white when scratched or pounded.
(*d*) Place some ice in a bowl of water.	(*d*) Ice is lighter than water
II. *To show how ice is formed.*	
Mix equal parts of salt and ice so as to form a freezing mixture.	As water gets colder and colder the temperature falls. At last when the temperature has fallen to 32° Fahrenheit or 0° Centigrade ice is formed.
Insert a can of water and test the temperature with a thermometer.	
Cork up tightly a flask full of water. Place in the mixture, and when the water is frozen examine it.	Water turning into ice expands, and the ice takes up more room than the water from which it was formed.
III. *To show regelation.*	
Take two smooth pieces of ice just thawing, and squeeze them together.	Pieces of ice just thawing can be welded together by pressure. [The teacher might then enlarge upon this, and tell the children that ice can by this property be moulded into various shapes, or twisted and contorted as in glaciers.]

IV. *Ice is crystalline.* Show the picture of snow crystals. If we were able to see what happened when a beam of sunlight falls upon and melts a piece of ice, we should see little hollows being formed corresponding to the solid snow crystals. This has been shown by melting a piece of ice before the lens of a lantern and casting the image on the screen.

V. *Glaciers.* Show a picture of a glacier. Refer to snowballs turning into ice when squeezed by the hands. Amongst the high mountains in the region of perpetual snow, layer upon layer falls continually pressing the lower ones, until they turn into ice. This glacier thus formed upon a slope slowly moves downwards.

VI. *Icebergs.* When a glacier reaches the sea or lake, large masses of it break off and float on the surface of the water. As ice is only slightly lighter than water, about one ninth of the mass of the iceberg floats above the water.

VII. *Uses of Ice.*

(*a*) Uses in domestic life.

(*b*) Protects the animals and plants in water by keeping out the excessive cold.

II. THE AIR WE BREATHE.

Articles of Illustration—A trough of water, tumbler, bicycle pump, syringe, a balance, the inner tube of a bicycle tyre.

EXPERIMENTS.	INFERENCES.
I. *To Show air is invisible, occupies space, offers resistance, has weight, etc.*	
(*a*) Take a tumbler, elicit that it is apparently empty. Turn it bottom upwards. Let a child press it thus down into the trough of water.	(*a*) Air occupies space and can be compressed, that is, it takes up room and can be pressed into smaller bulk.
(*b*) Let the tumbler spring up from the water. Press down the piston of syringe and let it fly back.	(*b*) Air is elastic.
(*c*) Ask if we can see air in the tumbler or around us.	(*c*) Air is invisible.
(*d*) Wave the hand, or a piece of paper backwards and forwards. Call attention to the force used to press down tumbler or piston of syringe.	(*d*) It offers resistance.
(*e*) Balance two flasks, one provided with pipe and stop-cock. Pump more air into the latter, and note result.	(*e*) Air has weight.
Weigh empty bicycle tyre tube, inflate and weigh again.	
(*f*) Fill the tumbler again to the brim, and press on its open end a stout piece of paper. Invert it.	(*f*) Air presses upwards as well as downwards.
(*g*) Make a sucker from a piece of leather. Show it will lift a stone or slate, etc.	(*g*) The pressure of the air is considerable, hence for animals to move about in it, besides pressing upwards and downwards it must do so in all directions.

II. *Air in motion—Wind.* Wave the hand to and fro, or blow with the mouth; we put the air into motion and cause wind to be felt.

Even on the calmest day the air is never quite still. Elicit terms which show the varying rates of movement of the air, such as Light Breeze, Strong Breeze, Gale, Storm, Hurricane.

III. *Direction of Winds.* Refer to weathercock, and its use, to tell us from what direction the wind comes.

IV. *Regular Winds and Variable Winds.* Some of the children will have heard of Trade Winds, and why they have this name given to them. These are regular winds, and blow in one direction throughout the year. In our country, however, the direction of the wind is constantly changing. We live in a region of variable winds.

V. *The extent of the air.* Draw a diagram of the earth showing that the air is a thin envelope extending definitely to a height of about fifty miles.

THE PRINCIPLES AND PRACTICE OF CLASS TEACHING.

IV.—DIVISION.

AS multiplication is a special case of addition, so division may be regarded as a **special case of subtraction.** The problem we solve in subtraction is to find what is left when one quantity is taken from another, or how much one quantity is greater than another. In division, the problem is to find how many times one quantity is contained in another ; and this may be performed by a **series of subtractions, or by the shorter process of division.** Division may also be regarded as the reverse of multiplication, as the analysis of a product into two factors, one of which is given, instead of finding the product of two given factors ; and accordingly we fall back on the **multiplication table** as the basis of our operations in division. For this reason it is important that the table should be learned and orally practised with a view to division as well as to multiplication. As we have already explained, when the child learns that the product of 3×6 is 18, he should also be taught to observe that 3 is contained in 18 six times, and 6 is contained in 18 three times. By this means he has become **familiar with the idea** of division, and has had considerable mental practice in the process, and what he has now to do is to apply this process in solving more complicated problems.

For the early examples, the short division form is the best. As a help to the 'placing' of the figures in the quotient, **vertical lines** should be drawn at first, as in teaching addition. The sums to be divided also should at first consist entirely of figures which **leave no remainder.** A few examples of this elementary kind wrought on the blackboard and then on slates will familiarize the pupil with the form in which the problems are to be wrought.

> Some explanation should be given **why we begin at the left** in division, while we begin at the right in addition, subtraction, and multiplication. This may be done when the teacher begins to explain 'carrying' in division ; as in addition we begin at the right in order to be able to carry up to a higher denomination, so in division we begin at the left in order to be able to carry down to a lower denomination.

When the problem of carrying comes to be faced, an easy example should be taken, like $74 \div 2$. Beginning with the tens place, 2 goes in 7 three times, and 1 over. We put down the 3 ; but **we have not yet divided the 7 tens, only 6 of them.** The remaining one cannot be divided **as a ten,** but it may be divided as **ten units.** We carry this ten down to the units column ; so instead of having 4 units to divide we have 14, which gives 7 as answer. The resemblance between this decomposition and that used in subtraction should be pointed out.

At this early stage of work the remainder from the units place should be simply written down as 'remainder.' In dividing 35 by 3, for example, the pupil reads his answer as '11 and 2 over.' It is somewhat more difficult to understand the reason for writing the remainder as a fraction. When this has to be done, it may be explained that the line represents the sign of division, and $11\frac{2}{3}$ as answer means that 35 contains 3 eleven times, and leaves 2 still to be divided by 3—a process we cannot complete in the meantime. The idea that 35 contains 3 eleven and two-third times is probably too difficult to be explained when the pupil has no knowledge of fractions.

The next step is to make the **transition to long division.** An example should be taken which can be wrought by short division, such as $7,398 \div 2$. It should first be wrought out on the blackboard in the ordinary short-division form. Next the teacher should arrange it as for long division, returning to the old help of drawing **vertical lines,** so as to make columns for hundreds, tens, etc. He should explain that in this form all the **multiplications** formerly done mentally are to have their **products written down,** and all the **subtractions are to be actually shown,** so that the remainders will appear as the answers to a series of subtractions. He should call attention to the fact that each figure is 'taken down' so as to occupy the same column, hundreds or tens, etc., that it held in the dividend at first, and that the figures in the answer fall into the corresponding column there. At every step he should show the identity of the processes in both forms of division—in the one the intermediate steps being noted on the slate or board, and in the other performed mentally. The next step should be to work an example of division where the divisor is too large for doing these steps mentally—say, 31— and the use of the longer form will at once become evident.

Some teachers adopt the following plan to secure that figures in the answer will be properly placed, and no ciphers omitted. Instead of writing the answer to the right of the dividend, as is usually done, they require it to be **written above the dividend.** Then as each figure is 'taken down' for division, the new figure of the answer obtained by dividing it is written *above* it. This calls the pupil's attention to the necessity for having a figure in the answer for each figure taken down in the dividend ; and as a help at an early stage of long division it is of undoubted service. The plan has certain advantages, and may be used for a time with profit.

Another plan, with less to recommend it from an educational point of view, has been used to facilitate division by large divisors. Suppose the divisor is 378, the pupils are directed first to write down on the margin of their slate what is really the 378 line of the multiplication table ; that is to say, they multiply 378 successively by 2, 3, etc., up to 9, and write down the products 756, 1,134, etc., up to 3,402, in a column on the edge of their slate. When they wish to find how often 378 is contained in any number which they may be dividing, they have only to turn to this column and find which number in it comes next below the number to be divided. This saves all delay with trial figures in the answer and consequent possibilities of error. The objection to the method is that it is entirely mechanical, and thus prevents any growth of power in fixing on the proper trial figure. But it has no doubt arisen as a means of defence, so to speak, against the equally mechanical and absurdly long tests often set in long division.

It has already been pointed out that there is no good reason for leaving over the study of one 'rule' till the preceding one has been practised to its full extent in large numbers ; here it may be mentioned that there is as little reason for dropping the practice of a rule already learned because a new one has been commenced. Addition, in particular, should still be carried on. At this more advanced stage it may well take the form of practice in **adding two columns at once,** units and tens. This is a most useful exercise, and one which, though very far removed from the usual simple addition of the common school, is yet easily learned. It has also a high value in giving the kind of mental training most to be aimed at in arithmetical teaching—the power of dealing mentally with large numbers.

TO OUR READERS:

The attention of teachers and students in London and the neighbourhood may profitably be called to the exceptional opportunity which the weekly excursions of the London Geological Field Class afford of acquiring a practical knowledge of the physical geography and geology of the London basin. A course arranged to illustrate the physical geography and geology of hills, valleys, and rivers in the basin of the Thames has just commenced, and will be carried on until the middle of July. Professor H. G. Seeley, F.R.S., is the leader of the excursions, and the teaching takes the form of short open-air lectures, in which the actions of the several denuding forces that have shaped the surface of the country and led to the existence of plateaux, hills, valleys, and river channels are illustrated by natural examples—the fact-knowledge being thus entirely substituted for the word-knowledge of books. No more pleasant means of obtaining sound ideas on physical geography could be desired than that afforded by these excursions. The secretary of the Class, Mr. R. H. Bentley, 43, Gloucester Road, Brownswood Park, South Hornsey, London, N., will furnish all particulars as to membership.

☞ **'THE SCHOOL JOURNEY,' a Means of Teaching Geography Illustrated by References to an actual Excursion in the Field, by Joseph H. Cowham, F.G.S., Lecturer on Education, Westminster Training College, will appear in the next number of the 'Practical Teacher.'**

THE INSPECTOR'S NOTE-BOOK.

BY AN INSPECTOR OF SCHOOLS.

Distinguished old boys. At one school I visited somewhat recently, I found the photographs of distinguished old boys hung on the walls. This struck me as a splendid idea. Of course it will be necessary to limit the distinction to men who can be said really to have won more than average distinction. It will act as a healthy stimulus to the present pupils.

* * * * * *

Children as teachers. The report of the Departmental Committee upon the Pupil Teacher question has created no small stir amongst voluntary managers up and down the country. Those in the know think that the recommendations will in great part be soon adopted. Personally, I shall be glad to see the employment of child labour in schools receive its quietus. Pupil Teachers of the 3rd and 4th years are generally able to teach a little, but it seems very uneducational to run a school with paid monitors, probationers, and the like. These are made use of chiefly in infant departments of from 60 to 120 in average attendance. These departments are of course dearer to maintain than larger ones. The infusion of teachers who have received a little of the secondary school culture should have a very beneficial effect upon primary education.

* * * * * *

Drawing under Whitehall. I am constantly being asked now as to what schemes of Drawing will be required under the new management. My advice to teachers is this: for the present continue upon the old lines, and, meanwhile, think out any alterations which you consider will benefit your particular school.

If you have nothing better to put in place of the S. K. syllabus do not tinker with it. I must confess that, in the matter of drawing up object lesson courses, I have seen very little originality. In many cases, and especially where teachers are experts in drawing, we shall expect a strong lead, introducing new lines which will be an improvement upon the past. To those who have the matter at heart let me commend to your consideration the ideas and principles of Mr. E. Cooke, the expert who fathered the alternative brush-drawing syllabus for the lower standards. His ideas, which he has expressed in book form, I believe, are founded upon psychological principles. Then again, every teacher should see the new *Art Monthly* published at the office of the PRACTICAL TEACHER. Such supplements as came out with the April number will be of incalculable help to schools. It has been issued just at the right time. The Blackboard sketches also are most useful. I say this purely in the interest of the schools.

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Attendance at Church. The children of many Anglican and Roman Catholic Schools are taken to church on holy days. This should be indicated on the Time Table. It is an easy matter to enter, for instance, the following:—On Wednesdays during Lent the registers are closed at 9.5 a.m. to enable the children to attend church at 11.15. Managers cannot be too particular over matters of this kind. It is not sufficient to make entries in the Log Book. It is surprising how much is known in London of these little things even when occurring in remote villages. There is always someone with a grievance, and it can be made known without even paying postage.

ANSWERS TO CORRESPONDENTS.

G.W.—I am afraid you misunderstand the Code. Unless you enter as a Queen's Scholar you must pass the second year certificate examination outside. You can then apply for one year's Training under Art, 115 (*b*). It is possible that you might gain admission directly the result was known. In any case it would be best to apply for permission before taking the 2nd year certificate examination. Why not try to get into another college next September? Would not that be better than delaying it? Try a day training college if the residential ones are full.

J.M.—Do you not refer to the May Examinations? Acting teachers can count marks gained in these science examinations. The questions published by Moffat and Paige are those set by the English Department. I know of no edition of the Scotch questions, but drop a card to John Menzies & Co., 12, Hanover Street, Edinburgh. The geography of Europe alone is meant.

T.M. (Burghead).—You may take Hygiene (Elementary Stage). In your case it is not compulsory to take Physiography.

A.G.C.—Very few schools take Animal Physiology as a class subject especially in the lower standards. The requirements of the inspectors vary with the district to some extent. But if I were you I should not tackle deeply the build of the human body. It is very unsuitable, especially for Standards 1 and 2. Why not prepare 30 more object lessons on common animals and leave the actual Physiology for the upper group? If you feel obliged to take up the human body, classify Standard III. with the higher standards for that, and stick to 30 object lessons for 1 and 2. Deal with the human body in an elementary fashion without bothering about the technical terms. If the children have the knowledge it matters little what terms they use. The highest children might pick up some of the scientific names.

W.S.—Though I am not absolutely certain I should say that the numbers 100 and 75 are the maximum marks, and that a teacher who got say a 2nd advanced would score less than one who got a first advanced.

M.G.—Your candidate may take first year's papers in October next and be apprenticed for three years from the 1st of January 1899 (Article 40).

L.L.—No, you are not compelled to take the subject. If you gained your Model last May you can have marks for it in your certificate examination. If your Model was got before then go in again in May and so obtain the marks.

K.A.M.—For Standard VI., VII. Composition, any of the following may be useful:—

(1) 'The Guide Series' (Davis & Moughton).
(2) 'Jackson's English Composition' (Brown & Sons).
(3) 'Register Model Essay Cards' (Dawson-Seedley).

With regard to the Pupil Teachers' Drawing you can do better than supply them with the *Practical Teacher's Art Monthly*. Gill & Sons and Waddington & Jackman publish Drawing-cards.

J.H.S.—Address your application to the Secretary. Three testimonials will suffice. Unless you have graduated you will be required to pass an examination which is about equivalent to the first University at the Dublin Royal.

G.B.—Yes, you are wise to qualify yourself in Drawing. It will help you in applying for the post you want, but after all a university degree is the most valuable item, so do not delay starting for this.

A.W.—You are not compelled to get rid of your Federation Aid Grant by the end of the school year, providing you can satisfy the Department that you intend doing good with it without unnecessary delay. It would not be allowable to charge the interest in Form IX. It might be treated as salary.

E.L.C.—You did not enclose an envelope for reply. You are not free to take a situation as assistant unless the Board will cancel your indentures.

L.Q.—You cannot sit to raise your certificate without missing a year, you must therefore wait till 1899.

J.H.S.—It will be difficult to procure questions. Skerry, Civil Service Coach, of Chancery Lane, London, could help you. He has passed men in this examination. I do not think the questions are published.

R.H.N.—The questions are not published. Very few examinations are held. Write to Skerry, Civil Service Court, Chancery Lane, London, who has passed men for this post. He could help you.

J.M.—Please consult me as often as you find yourself in difficulties. I am always pleased to hear from correspondents who live in such remote parts. You are right. The Science and Art Department holds an examination in Physiography on Thursday, June 23rd, from 2 to 5 p.m. Marks then gained would count to you.

Correspondents wishing a reply by post must enclose a stamped addressed envelope.

Letters should be addressed—'Inspector, care of the Editor, 33, Paternoster Row, London.'

EXAMINATION FOR LONDON SCHOOL BOARD SCHOLARSHIPS.

(*Continued.*)

AT the Preliminary Examination which was held on the 1st and 2nd of last December, 120 boys and 69 girls satisfied the examiners. All but two of these candidates sat at the Intermediate Examination which followed on December 13th and 14th. Each candidate was allowed to enter for two subjects from the following list:—Physiology, Elementary Science, Mechanics, Chemistry, Algebra, Euclid, Domestic Economy, Botany, French, Latin, Drawing. The last subject was for girls only, as it was an essential subject for all boys in the Preliminary Examination.

The questions set in all the subjects are given below, with answers to the Algebra, and to the numerical questions on Mechanics.

The 44 boys and 24 girls who obtained more than 400 marks out of a possible 550 underwent a final examination, *viva voce*.

With respect to the examinations to be held on the 30th April and 21st of May, we may add that among the scholarships to be competed for are eleven Boarding Foundation Scholarships for boys, tenable at Bancroft's School, Woodford. The subjects of examination are Arithmetic, Dictation and Handwriting, Composition, Drawing, History and Grammar, with two of the following to be selected by the candidates, viz., Latin, French, Algebra.

These scholarships, regarded as of the value of £70 a year for four years, are given by the Drapers' Company.

QUESTIONS SET AT THE INTERMEDIATE EXAMINATIONS.

Animal Physiology.

Time allowed—2 hours.

1. Describe clearly the act of breathing.
2. What organs are contained in the thorax? State briefly the function of each.
3. Describe the course of the circulation of the blood; and contrast venous and arterial blood. (*Diagram.*)
4. Name and give the position of ten bones in the human body.
5. What are tendons? Describe their texture.
6. What is the usual temperature of the blood in the human body? How is it kept so constant?
7. Describe the organ of sight. (*Diagram.*)
8. Describe the changes a piece of meat undergoes whilst being digested.
9. What gives rise to perspiration? What is its use?
10. What is the difference in function between motor and sensory nerves? What is meant by *reflex action*?

Elementary Science.

Time allowed—2 hours.

1. Define the following terms, and give one instance of each:—*Equilibrium, centre of gravity, specific heat, evaporation.*
2. Explain what is meant by *porosity*. How could you prove that there are pores in chalk?
3. Why do you call some substances elements, and others compounds? Give examples of both.
4. What is chemically pure water, and how can it be obtained?
5. What is a water-filter? Explain the construction of one that you have seen.
6. Explain how we see things enlarged through a magnifying glass.
7. Explain exactly how you would determine the specific gravity of a piece of lead.
8. A stick of sealing-wax held in the hand and rubbed with dry flannel is found to become electrified. A brass rod after being treated in the same way shows no electrification. How do you account for the difference?
9. What is the difference between a liquid and a gas? Explain why a fire-balloon ascends.
10. How can the quantity of light derived from different sources be compared?

Mechanics.

Time allowed—2 hours.

1. Explain the following terms, and give one example of each:—*Velocity, acceleration, force, momentum.*
2. Define and prove the parallelogram of velocities.
3. Describe the construction of a pair of scales. How could you get the true weight of a body, if the arms were unequal?
4. The arms of a lever are respectively 10 inches and 14 inches long, and the weight of 8 lbs. is attached to the shorter arm. Find the power.
5. What condition must be fulfilled in order that a body may be in equilibrium upon a hard smooth plane surface?
6. Describe a pulley of the second order, and show what its mechanical advantage is.
7. Describe any experiment to prove that the distance which a body moving under a given force will traverse in a given time is proportional to the square of the time.
8. Explain the construction of the wheel and axle. What power will support a weight of 1½ tons if the circumference of the wheel and axle are respectively 56 inches and 6 inches?
9. What is the centre of gravity of a body? How could you find the centre of gravity of an irregular four-sided figure?
10. Describe and explain the action of the force pump.

Chemistry.

Time allowed—2 hours.

1. Define—*Atom, molecule, chemical compound, mechanical mixture.*
2. How can you prove that air is not an element?
3. What happens when steam is passed over iron heated to redness? Write down the equation.
4. How is sulphur obtained in (*a*) England, (*b*) Sicily? Describe the effects produced on it by heat.
5. How can oxygen gas be prepared? Describe experiments illustrating its chief properties.
6. What is the action of hydrochloric acid on marble? How can you prove that the gas thus obtained exists in respired air?
7. Explain why an extinguisher puts out the flame of a candle, and describe experiments that can be made in support of your explanation.
8. How would you make and collect carbon dioxide? Describe any experiments you have made with it.
9. A small jet of hydrogen is burnt under a clean, dry glass bell jar standing over water. Give a full description of what may be observed.
10. Give the chief properties of chlorine. How is it prepared from common salt?

Algebra.

Time allowed—2 hours.

1. A man makes a journey of x miles. He travels a miles in a train, b miles in a coach, and walks the rest of the journey. Express, algebraically, how far he walked.
2. If $a = 1$, $b = 2$, $c = 3$, find the numerical value of
$$\frac{ab}{c} + \frac{bc}{a} + \frac{ca}{b} + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}.$$
3. Simplify $3(a^2 - b^2) - [2a^2 - 2\{b^2 + ab + (b - a + b)\}]$.
4. Multiply $2x^3 - 5x^2 + 4x - 1$ by $3x^2 - x + 2$.
5. Divide $6x^4 + 5x^3 + 6x^2 - 17x + 6$ by $6x^2 - 7x + 2$.
6. Resolve into factors: (1) $x^2 + 9x + 20$; (2) $x^4 - 81$.
7. Reduce to its lowest terms $\dfrac{4x^3 - 17x + 12}{6x^2 - 17x + 12}$.
8. Simplify $\dfrac{x^2 - 2x + 3}{x^3 + 1} + \dfrac{x - 2}{x^3 - x + 1} - \dfrac{1}{x + 1}$.
9. Solve $\dfrac{x - 1}{9} - \dfrac{2 - x}{4} - \dfrac{2x - 1}{14} + \dfrac{2 - 3x}{30} = 0$.
10. A bill of £3 1s. 6d. was paid in half-crowns and florins, and the whole number of coins was 28. How many were there of each?
11. Solve $\dfrac{x + 1}{y - 1} - \dfrac{x - 1}{y} = \dfrac{6}{y}$, $x - y = 1$.
12. Solve $2x^2 + 3x - 35 = 0$.

Euclid.

Time allowed—2 hours.

1. If two triangles have two sides of the one equal to two sides of the other, each to each, and have also the included angles equal, prove that the bases must also be equal.
2. If one side of a triangle be produced, prove that the exterior angle is greater than either of the interior opposite angles.

A straight line BC is produced to X, and XA is drawn perpendicular to BX, prove that the angle CAB is acute.

3. Describe a triangle whose sides are equal to three given straight lines.

Describe a right-angled triangle having given the hypotenuse and one side.

4. If a straight line falling on two other straight lines makes the alternate angles equal, these two straight lines shall be parallel.

BCA and BCD are two equilateral triangles on the same base BC and on opposite sides of it; prove that ABCD is a parallelogram.

5. Parallelograms on the same base and between the same parallels are equal in area.

6. The complements of the parallelograms about the diagonal of a parallelogram are equal in area.

7. If the square on one side of a triangle is equal to the sum of the squares on the other two sides, prove that the triangle is right-angled.

8. Prove that the straight line joining the middle points of two sides of a triangle is parallel to the base.

9. If a straight line be divided into any two parts, then the rectangle contained by the whole and one of the parts is equal to the rectangle contained by the two parts, together with the square of the aforesaid part.

10. Describe a square which shall be equal to a given rectilineal figure.

Domestic Economy.

Time allowed—2 hours.

1. What is *albumen?* In what foods is it found?

2. Compare the values of beef, mutton, poultry, and fish under the heads of nutrition and economy.

3. Give directions for (*a*) poaching eggs, (*b*) making a plain bread pudding.

4. Why should water for drinking purposes be boiled or filtered? Describe some process of filtering.

5. What do you know about the skin in the human body? Describe the action on the skin, of (*a*) a cold bath, (*b*) soap.

6. What precautions would you take when washing (*a*) flannels, (*b*) coloured cottons?

7. What is ventilation? What are the chief causes of impure air in sitting-rooms? How is the air of a room affected by a fire in the grate?

8. Compare linen and flannel as used for clothing purposes. What points would you take into consideration in buying flannel?

9. Why is dusty air unwholesome? Give directions for (*a*) scouring boards, (*b*) sweeping a carpeted room.

10. How are chilblains caused? What is the proper treatment for chilblains?

Botany.

Time allowed—2 hours.

1. In what manner does a plant obtain its supplies of nitrogen, carbon, and oxygen?

2. Explain fully the various respects in which a petal differs from a leaf.

3. Mention some of the chief forms of stipules.

4. By what characteristics are roots distinguished from stems and leaves?

5. Name and describe three different kinds of inflorescence.

6. Describe the fruits in the Strawberry and the Poppy.

7. Point out the characteristics of the flower in Cruciferæ.

8. Give a description of the leaf, flower, and fruit of the Buttercup.

9. Define a *genus*, a *species*, and a *variety*.

10. Describe the process of germination in a Bean and in Mustard.

French.

Time allowed—2 hours.

I. Translate into English.

1. Le chien est l'animal le plus fidèle.
2. As-tu donné le livre de mon frère à Charles?
3. Les ciels de ces tableaux sont trop sombres.
4. Si nous trouvions un acheteur, nous vendrions cette maison.
5. Nous serons bien mieux ici qu'en bas.
6. Combien faut-il pour aller d'ici chez votre beau frère.
7. Nous serons en retard. Vous savez que c'est à onze heures que l'on déjeune.
8. Les soldats étaient venus parce que voleurs avaient échappé de la prison.

II. Grammatical Questions.

1. Give the various forms of the partitive article in French. Make short sentences to show how this article is used.
2. Classify the rules for forming the plural of nouns in French. Give one example of each rule.
3. Give the feminine singular and plural of—*Un beau garçon, le cochon blanc, ce bon vieillard, mon vieil ami.*
4. Name three French adjectives that have a double form in the masculine singular, and show by examples why this is so.
5. Write out in full tabular form (*a*) the fut. perf. indic. act., (*b*) pres. conditional, (*c*) pret. def., of *gager, obéir, apercevoir,* and *répondre.*
6. Give in tabular form the 1st pers. sing. (*a*) pres. indic., (*b*) fut. absol., (*c*) pres. conditional, (*d*) imperf. indic., (*e*) fut. perf., of *aller, faire, dire, rire,* and *mettre.*

III. Translate into French.

1. Your sister has not lent them my book.
2. How old are you? I am thirteen.
3. Louis the Fourteenth died in seventeen hundred and fourteen.
4. I have given some warm water to my sister's friend.
5. Is your house larger than ours?
6. I will give it to you if you wish.
7. You must call at his house this evening.
8. An old man that worked in the garden was there.

Latin.

Time allowed—2 hours.

1. Translate into English :—
   (*a*) Puella rosam odoram portabat.
   (*b*) Servi ignavi catenas ferreas timebunt.
   (*c*) Oves timidae leonis dentes sentient.
   (*d*) Mox hominum canumque vocibus territus per campum fugit, et cursu levi canes eludit.
   (*e*) Milites ab imperatore vocamini.
   (*f*) Puerorum felicium sorores in horto ludebant.
2. Grammatical Questions :—
   (*a*) Decline, in the singular, *filius* and *pax*; and in the plural *filia* and *res.*
   (*b*) Decline, in full, singular and plural, *bonum opus.*
   (*c*) Give, with the English, *six* Latin nouns that have different meanings in singular and plural.
   (*d*) Give the comparative and superlative of—*durus, tristis, facilis, bonus, multus, digne, male.*
   (*e*) Give the principal parts of—*sum, amor, moneor, regor, audior, utor.*
3. Translate into Latin :—
   (*a*) The mother praises the good daughter.
   (*b*) We will teach the farmer's son.
   (*c*) The queen's soldiers are guarding the harbour.
   (*d*) After sleep come cares.
   (*e*) I shall be wounded with weapons.
   (*f*) The master was punishing the idle boys.

Drawing (Girls.)

Time allowed—2 hours.

Freehand.

Candidates are required to copy carefully in pencil the printed example; increasing the height about one inch, and the width in proportion. No ruling or measuring of any kind is allowed.

Geometrical.

(*The construction must in each case be fully shown.*)

1. Draw a straight line perpendicular to a given straight line AB from a given point C outside it.

2. Construct a triangle ABC, the angle ABC being 60°, the side BC 2 inches long, and the sum of the sides AB, AC 5 inches.

About a circle of 1½-inch radius describe a regular pentagon.

Answer to questions in Mechanics.

4. 5⅔ lbs. 8. 3 cwt. 24lbs.

Answers to Algebra.

1. $(x - a - b)$ miles.
2. 10.
3. $a^2 + 2ab - b^2 - 2a + 4b$.
4. $6x^5 - 17x^4 + 21x^3 - 17x^2 + 9x - 2$.
5. $x^2 + 2x + 3$.
6. (1) $(x + 4)(x + 5)$; (2) $(x^2 + 9)(x + 3)(x - 3)$.
7. $\dfrac{2x^2 + 3x - 4}{3x - 4}$.
8. $\dfrac{x^2 - 2x}{x^2 + 1}$.
9. $x = 4$.
10. 11 half-crowns and 17 florins.
11. $x = 3$, $y = 2$.
12. $x = 3\frac{1}{3}$, or -5.

PROBLEMATIC TESTS FOR ALL STANDARDS.

***** ARRANGED FOR THE FOUR QUARTERS, SO THAT THEY CAN BE USED ALL THE YEAR.**

Standard I.—2nd Quarter.

16. I had 310 oranges, three were bad, and I gave four away. How many had I left?

17. I had one hundred and eighty-four marbles. My brother had nineteen less than I. How many had he?

18. Put down one hundred and one. Take away twenty-nine. How many are left?

19. How many more is fifty-one than fifteen?

20. A boy had two hundred and three apples. He gave ninety-four away. How many had he left?

21. There are seven hundred and thirteen oranges in a box; two hundred and sixty-eight are bad? How many good ones are there in the box?

22. There are one hundred and twenty windows, and eighty-five are broken. How many whole ones are there?

23. How many more nuts must I give Lizzie for her to have thirty nuts, if she has already nineteen?

24. There are one hundred and twenty cows in a field. How many are left when thirty-five have been taken out?

25. Mary takes eighteen pins out of a paper, which had at first one hundred pins. How many are left in the paper?

26. In a school of 902 children, five hundred and thirty-eight were girls. How many were boys?

27. If from five hundred and nineteen nuts I take one hundred and seventy-seven, how many would be left?

28. John only came to school three hundred and nine times. He ought to have come four hundred and ten times. How many times was he away?

29. Alice is nine years old; her father is forty-one years. How many years is her father older than Alice?

30. In a field there were seven hundred and fifty-two sheep. The butcher took away two hundred and fifty-seven. How many remained in the field?

STANDARD I.—ANSWERS.

2nd Quarter.

16. 303 oranges.
17. 165 marbles.
18. 72.
19. 36.
20. 109 apples.
21. 445 oranges.
22. 35 windows.
23. 11 nuts.
24. 85 cows.
25. 82 pins.
26. 364 boys.
27. 342 nuts.
28. 101 times.
29. 32 years.
30. 495 sheep.

Standard II.—2nd Quarter.

16. In a regiment of soldiers there were six rows, and seventy-eight soldiers in each row. How many soldiers were there?

17. There are 35 houses in a street, and each house has twelve windows. How many windows are there in the street?

18. How many feet have six hundred and ninety-seven horses?

19. There were twelve fields, each containing three thousand seven hundred and ninety-two animals. How many were there altogether?

20. A gardener planted seven hundred and fifty-nine cabbage-plants in each of twenty-three rows. How many plants were there?

21. If a scholar wrote nineteen thousand seven hundred and twenty-five words in one calendar month, how many would he write in 6 years?

22. There are 15 words on a line, 20 lines on a page, and 120 pages in a book. How many words are there in the book?

23. In a class of seventy-five boys each boy received seven thousand three hundred and eighty-nine marks in a year. How many marks were given altogether?

24. A railway train can go a quarter of a million miles in a certain time. How far could 293 such trains go in the same time?

25. Find the product of two hundred and thirty-nine thousand and sixty-nine and four thousand and eighty.

26. If a quarter of a million best bricks and one hundred and three thousand seven hundred and 95 common bricks be used to build a house, how many bricks would be required to build 705 such houses?

27. To 7 add the same number fifteen times.

28. A man goes on a journey one thousand eight hundred and forty-two miles. He travels by horse 237 miles, by ship 596 miles, he walks 58 miles, and takes train the remainder of his journey. How far does he travel by train?

29. A dealer unpacks 39 boxes of eggs, each containing two gross, and finds 75 bad ones and 15 broken ones. How many whole good ones are there?

30. A builder buys 16 fields at 735 pounds each, and twenty-five houses at three hundred and fifty-six pounds each. How much money does he spend?

STANDARD II.—ANSWERS.

2nd Quarter.

16. 468 soldiers.
17. 420 windows.
18. 2,788 feet.
19. 45,504 animals.
20. 17,457 plants.
21. 1,420,200 words.
22. 36,000 words.
23. 554,175 marks.
24. 73,250,000 miles.
25. 975,401,520.
26. 249,425,475 bricks.
27. 112.
28. 951 miles.
29. 11,142 eggs.
30. 20,660 pounds.

Standard III.—2nd Quarter.

16. A factory-master paid in wages the following sums:—Thirteen shillings and sixpence halfpenny, three hundred pounds and three-halfpence, £64,053 17s. 6½d., eight shillings and fourpence halfpenny, and £25 5s. 7d. How much was paid in wages altogether?

17. Find the total cost of the following:—A cheese worth 9s. 10½d., a ham worth twice as much as the cheese, a flitch of bacon worth the ham and the cheese together, and a chest of tea equal in value to the flitch and cheese.

18. Six brothers had money in the bank:—John had £245 6s. 7½d., James had ten shillings and sixpence three-farthings, Harry had £640 10s. 9½d., Joe £18,101 11s. 1½d., Arthur had two thousand pounds, and Fred £2,047 13s. 3½d. How much had the six brothers altogether in the bank?

19. A merchant paid £15 3s. 7½d. to a grocer; twenty-nine pounds eighteen shillings and a halfpenny to a draper; eighteen pounds to a butcher, and he then had £39 19s. 11d. left. What had he at first?

20. A farmer bought a cow for nineteen pounds seventeen shillings and fourpence halfpenny, and a horse for £42 15s. 6½d., and he then had 14 guineas left. What had he at first?

21. Find the total cost of 2 gross of buttons at 6½d. per dozen, 3 dozen collars at 9 pence each, 3 pocket handkerchiefs at 10½d. each, 18½ yards of cloth at 1s. per yard, and 5 pairs of stockings at 1s. 3d. per pair.

22. What had I left out of a £5 note after spending a guinea, half-a-guinea, a crown, half-acrown, and 17 pence?

23. A wholesale dealer bought £3,604 12s. 6d. worth of ham, £365 18s. 6½d. worth of cheese, £6,829 10s. 3½d. worth of eggs, £870,263 11s. 11½d. worth of butter, and four thousand pounds worth of bacon. How much did he spend?

24. A shopkeeper owed £74 13s. 9d., £367 18s. 11½d., 47 guineas, seventy-eight shillings, and £2,571 4s. 10½d. How much did he owe altogether?

25. A builder bought several plots of land, giving £528 14s. 11½d., £854 19s. 4d., £578 18s. 9½d., five hundred and seven pounds and three farthings, and eight hundred and fifty-nine pounds fourteen shillings and 11½d., respectively for them. How much money did he spend altogether?

26. A father leaves his two daughters £171 14s. 6½d. each, his eldest son £195 4s. 8d., his second son 95 guineas, and his youngest son £210 19s. 10½d. How much money did the father leave for his children?

27. Find the cost of a house from the following:—36,000 bricks at 9s. per thousand, mortar £5 17s. 9½d., slates £9 17s. 10d., joiner's work £50 10s. 5½d., plasterer's bill 18 guineas, plumber's bill £17 15s. 4½d. and paperhanger and painter's bill £16 9s. 0½d.

28. Find the cost of the following provisions: 8 lbs. of cheese at 8d. per lb., 5 lbs. of tea at 4s. per pound, 12 lbs. of ham at 11d. per lb., and 4 lbs. of bacon at 6d. per pound.

29. £26 13s. 4½d. plus £9 8s. 11d., plus ten shillings and nine pence, plus £2 18s. 0d., plus 17s. 1½d., plus elevenpence three farthings.

30. I draw £305 17s. 6½d. from the bank on each of four occasions, and have still £7,551 1s. 3d. standing to my account. How much had I in the bank at first?

STANDARD III.—ANSWERS.

2nd Quarter.

16. £64,380 5s. 2d.
17. £4 18s. 6½d.
18. £23,035 12s. 5d.
19. £103 1s. 7d.
20. £77 6s. 10½d.
21. £3 7s. 4½d.
22. £2 19s. 7d.
23. £885,063 13s. 3½d.
24. £3,067 2s. 7½d.
25. £3,329 8s. 1½d.
26. £849 8s. 7½d.
27. £135 12s. 6½d.
28. £1 18s. 4d.
29. £40 9s. 1½d.
30. £8,574 11s. 5d.

Standard IV.—2nd Quarter.

16. What shall I have to pay for half-a-million articles at one farthing each?

17. How many half-guineas are there in five hundred and twenty-five half-crowns?

18 A tailor bought a piece of cloth at half-a-crown a yard. He spent 50 guineas; what was the length of the piece?

19. A man had in his purse 5 sovereigns, 7 half-sovereigns, 3 half-crowns, 4 shillings, and 11 sixpences; how many threepenny pieces could he get for his money?

20. A boy had 718 half-crowns, and his sister 817 florins; how much richer is one than the other?

21. A collection amounted to £2,492 and was made up of guineas, sovereigns, half-crowns and shillings, there being an equal number of each. How many shillings were there?

22. What number must I multiply £5 17s. 4½d. by to make £223 0s. 3d.?

23. What will it cost to fence a field 2½ miles in circumference at 1½d. a yard?

24. A grocer bought 3 cwt. of sugar at 2½d. a lb. and sold it at 3½d. a lb.; what did he gain?

25. What is the difference between 738 crowns and 2,087 florins?

26. A dress takes 11¾ yards; how many dresses can be made from 634½ yards?

27 A horse and carriage together cost £90 and the carriage cost four times as much as the horse; what did each cost?

28. How many yards of telegraph wire will be required to stretch 63¾ miles?

29. Seventeen parcels, each weighing 19 stones, were made out of 6 tons 14 cwt.; how many lbs. were left?

30. How many bricks 9 in. long will it take to reach a quarter of a mile?

STANDARD IV.—ANSWERS.

2nd Quarter.

16. £520 16s. 8d.
17. 125 half-guineas.
18. 420 yards.
19. 748 threepenny-pieces.
20. £8 1s.
21. 1,120 shillings.
22. 38.
23. £22 18s. 4d.
24. £1 15s.
25. £24 4s.
26. 54 dresses.
27. Horse £18. Carriage £72.
28. 112,200 yards.
29. 10,486 lbs.
30. 1,760 bricks.

Standard V.—2nd Quarter.

16. Find the cost of 50 bottles of wine at 50s. per doz.; 3 gallons at 3s. per pint; 2 pints at 7s. 6d. a gallon; and 9 bottles at a guinea per dozen.

17. Calculate the following items: 16 cwt. at 13d. per cwt.; 4 oz. at £1 18s. per lb.; 10½ yds. at 2s. 3d. a yd.; 13¾ lbs. at 7d. per lb.; 3½ doz. at 9½d. a doz. Deduct 5 per cent. from the pounds, and then receipt the bill.

18. What would a rate collector receive for the following rates: £20 at 3½d. in the £; £50 10s. at 4d. in the £; £76 15s. at 6d. in the £; and £100 6s. 8d. at 3d. in the £?

19. A builder has the following wages to pay: 3 men each 4½ days at 3s. 6d. a day; 2 men each 4½ days at 4s. 9d. a day; and 5 men each 4½ days at 5s. 6d. a day. What was the amount of his wages' bill?

20. If a man can walk 18 miles in 4½ hrs., how long will it take him to walk 540 miles?

21. If 28 cows are worth 168 sheep, how many sheep can a man get in exchange for 252 cows?

22. A train travels at the rate of 45½ miles an hour; in what time will it travel 204¾ miles?

23. If 3 casks weigh 4 cwt. 2 qrs., what will be the weight of 36 casks, each of the latter being half the size of the former?

24. Two brothers invest together in a concern £14,000. One receives as his share of the profits £500 per annum, and the other £200 per annum. How much did each invest?

25. A person has an income of £450 a year. The income tax is 8d. in the £. No charge is made on the first £150 on the income. What is the amount of the tax paid?

26. A bankrupt paid 5s. in the £. He pays his creditors altogether £725 10s. What do his debts amount to?

27. A mason can build a wall in 18 days working 8 hrs. a day. How many hours a day must he work to finish it 3 days sooner?

28. A bankrupt owes £4,500, and he had £1,200 wherewith to pay his debts. How much did he pay in the £?

29. If 27 men earn £67 10s. in a fortnight, how much will they earn in a year?

30. A garrison of 900 men is provisioned for 20 days, and receives a reinforcement of 100 men. How long will the provisions last?

STANDARD V.—ANSWERS.

2nd Quarter.

16. £14 17s. 11½d.
17. £2 18s. 3d.
18. £4 6s. 1½d.
19. £10 11s. 1½d.
20. 135 hours.
21. 1,512 sheep.
22. 4½ hours.
23. 27 cwt.
24. £10,000 and £4,000.
25. £10.
26. £2,902.
27. 9⅜ hours.
28. 5s. 4d.
29. £1,755.
30. 18 days.

Standard VI.—2nd Quarter.

16. What will £768 6s. 8d. amount to in 3 years at 2½ per cent. per annum?

17. In a school there are 720 children. There are 8 boys for every 10 girls. How many boys are there?

18. Bring ⅘ of 2½ pints to the decimal of a bushel.

19. At 9 o'clock in the morning ⅘ of the children in a school were present, and when 12 more had come it was found that ⅞ were present. How many names were on the registers?

20. If the interest on £27 2s. be 18s., what should it be on £4,065?

21. After paying income tax at the rate of 4d. in the £, a man found he had £655 12s. 9d. left. What was his income?

22. Find the simple interest on £600 for 2½ years at 3½ per cent. per annum.

23. Find the value of ·326 of 1¼ miles.

24. A man spent ·458 of his money and found he had £1 0s. 3½d. left. What had he at first?

25. What number bears the same relation to 1·2 as 9½ does to 6?

26. Find the interest on £240 15s. for 2 years at 4½ per cent.

27. A post has ⅖ of its length in the sand, 8 ft. in the water, and 7 ft. above the water level. Find its whole length.

28. If a sum of money gain £7 8s. in 185 days, in how many weeks will it gain £8 6s. 6d.?

29. Divide the sum of $\frac{5}{8}$ and $\frac{1}{4}$ by their difference.

30. If £52 is ·975 of a sum of money, what is the whole sum?

STANDARD VI.—ANSWERS.

2nd Quarter.

16. £825 19s. 2d.
17. 320 boys.
18. ·03125.
19. 160 names.
20. £135.
21. £666 15s.
22. £46 4s.
23. 3 fur. 10 poles 2½ yds.
24. £1 17s. 6d.
25. 1·9.
26. £21 13s. 4½d.
27. 21 feet.
28. 29$\frac{1}{13}$ weeks.
29. 1$\frac{8}{9}$.
30. £53 6s. 8d.

Standard VII.—2nd Quarter.

16. In 1886 the population of a town was 46,200. In 1896 it had risen 3½ per cent. What was the population in 1896?

17. In what time will £35 double itself at 3½ per cent. per annum, simple interest?

18. Three men are respectively 6 ft., 5 ft. 10 in., and 5 ft. 8 in. in height. A fourth man is so small as to reduce the average by half a foot. Find the height of the fourth man.

19. If A gets 6 runs to B's 4, and B gets 4 to C's 3, how many runs do they each get out of 260?

20. A rectangle measures 48 ft. by 36 ft. Find the area of a square which has the same perimeter as the rectangle.

21. I sell a house for £140 and lose 30 per cent. What should I have sold it for to gain 15 per cent.?

22. Two men commence business together. One puts in £376 and the other £188. At the end of the year there is a profit of £67. What share should each get?

23. The average temperature for a week is 60·37°. On Sunday the temperature was 66·13°. What was the average of the other days?

24. How many slates measuring 16 in. by 12 in. will be required to cover a roof which measures 24 ft. by 18 ft.?

25. What is the gain per cent. by selling 3 cwt. of sugar, which cost 3½d. per lb., for £5 12s.?

26. Divide £640 among A, B, and C, so that A shall have 4 times as much as B, and B 3 times as much as C.

27. I bought a carriage for £47, and sold it at a loss of 12½ per cent. What did I get for it?

28. What sum will amount to £52 13s. 0½d. in 3½ years at 4½ per cent. per annum?

29. Find what length of wallpaper 18 in. wide will be required for a room 12 ft. long, 8 ft. broad, and 14 ft. high.

30. By selling some sheep at £420 a farmer gained 16⅔ per cent. Find the cost price?

STANDARD VII.—ANSWERS.

2nd Quarter.

16. 47,817.
17. 28⅘ years.
18. 3 ft. 10 in.
19. A 120, B 80, C 60 runs.
20. 196 square yards.
21. £230.
22. £44 13s. 4d.; £22 6s. 8d.
23. 59·41°.
24. 324 slates.
25. 14⅔ per cent.
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27. £41 2s. 6d.
28. £45 16s. 8d.
29. 124½ y ards.
30. £360.

NEEDLEWORK FOR PRACTICAL TEACHERS.

By the Author of 'Blackie's Manual of Needlework.'

WHILE THESE NOTES ARE WRITTEN SPECIALLY TO MEET THE REQUIREMENTS OF CERTIFICATE CANDIDATES, THEY WILL BE FOUND USEFUL BY **ALL TEACHERS** WHO HAVE TO PREPARE FOR EXAMINATION IN THIS SUBJECT.

SECOND YEAR STUDENTS.

Collar Bands and Collars of Nightdresses.

(*a*) *Collar Bands.*—Many nightdresses are finished with plain collar bands such as the one given in the diagrams of the January number of this paper.

Plain collar bands may be either straight or rounded at the short edges. In either case, stitch the short ends about ⅛ of an inch from the raw edges; turn the band over, fell it on to the nightdress on both sides and stitch or featherstitch it all round about ⅛ of an inch from the edges. The ornamentation of it may be done before felling it on to the garment.

(*b*) *Collars.*—But the fashion at present is to have collars. Four shapes, the *diagrams* of which were given in the March number, are shown below. Those collars may be double or single. But single collars are sufficiently strong, as on nightdresses they are more for ornament than utility. They may be attached to a cross or even band, or they may be stitched to the neck of the garment and a narrow strip of the material (cut on the bias) be felled over the raw edges. If the nightdress have a saddle yoke insert the collar between its folds.

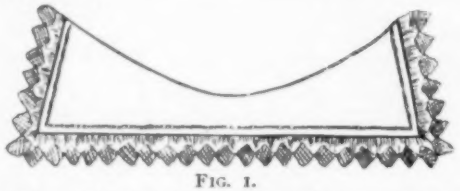

Fig. 1.

Fig. 1 is a plain *peaked* collar. The edges are turned to the *right* side and stitched down close to the edge of the fold. The lace is whipped up lightly and sewn round the collar on the *wrong* side.

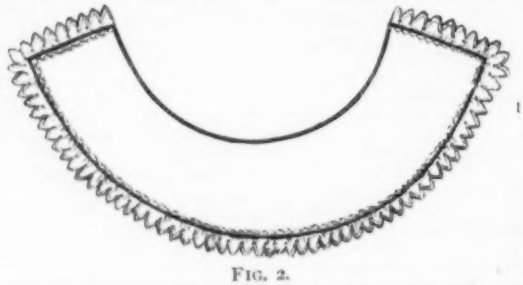

Fig. 2.

Fig. 2 is a *rounded* collar, the edges of which are turned to the *wrong* side, and kept down by a row of feather-stitching worked on the right side.

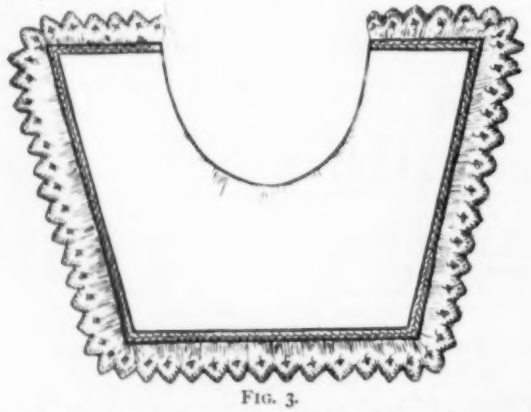

Fig. 3.

Fig. 3 is a *sailor* collar with an embroidered frill. The raw edge of the collar is turned up for ⅛ of an inch on the *right* side, and the frilling is gathered or pleated and placed above this turned-up edge. The raw edges of the collar and frill are covered over with a row of feather-stitched edging or embroidered insertion which is hemmed down or stitched at both sides.

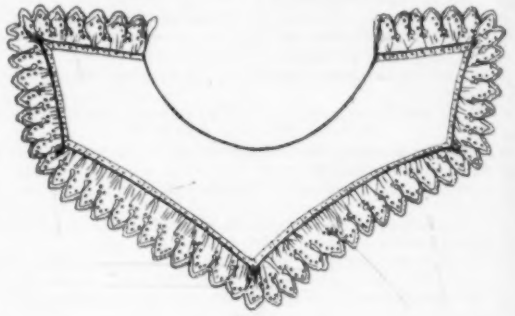

Fig. 4.

Fig. 4 is a more elaborate collar. It may be finished exactly like Fig. 3 or Cash's frilling and torchon or Valenciennes lace may be substituted for the embroidery. The frilling may be whipped up as well as the lace, and feather-stitching and knotting take the place of the insertion.

FIRST YEAR'S STUDENTS.

How to make and insert the Sleeves of Overalls.

(*a*) *Seams.*—The seams should correspond with those of the skirt, and have already been described. If they have an even and a cross side the *even* side must be the *upper* one.

(*b*) *How to finish the Sleeves at the Wrist.*—According to Fig. 1 the sleeve may be gathered (with the exception of 2 inches on each side of the seam) and inserted into a plain band 9 × 1 when finished. The band may be ornamented with one or two rows of feather-stitching and a narrow lace. Figs. 2 and 3 show sleeves which have been gathered at the two dotted lines seen on the diagram of the overall given in the February number of this magazine. But while Fig. 2 has been gathered only at the two dotted lines, Fig. 3 has an additional gathering thread down the centre, and while Fig. 2 has the band on the *right* side, Fig. 3 has it on the *under* or wrong one.

Fig. 1.

Fig. 2.

The sleeve is finished at the foot by a narrow hem ⅛ of an inch deep with a row of feather-stitching covering the hemming. Fig. 4 is smocked at the wrist and finished at the edge by embroidery or blanket stitch.

(*c*) *How to insert the Sleeves into the Armholes and Yoke.*—(1) If the yoke be unlined the raw edges of the overall and the sleeve may be simply stitched on the *wrong* side and the raw edges overcast.

Instead of overcasting the raw edges a better plan is to bind them with a narrow strip *cut on the bias* of the same material as the garment is made of, or a piece of tape or muslin binding.

2. If the yoke be lined, turn in the edges of the yoke on the right and wrong sides and lay a fold along the lower part of the armhole. Insert the gathered part between the yokes and fell both sides neatly; hem or stitch the lower part of the armhole on to the sleeve on the *right* side and bind or overcast the wrong one.

FIG. 3.

FIG. 4.

3. Figs. 3 and 4 show how to finish the sleeve at the top when the sleeve is to be placed *above the garment*. Overcast the raw edge of the top of the sleeve; double down a fold about ¾ of an inch deep; gather it with two or three rows of gathering and stitch it firmly on. Before stitching the sleeve on close the yoke at the shoulder point, and either overcast or hem the lower part of the armhole.

GENERAL REMARKS ON CALICO PATCHING.

There are several ways of inserting a calico patch. Students should know all the methods but practise only one.

(*a*) When doing a specimen the two pieces of material representing the garment and the patch should be torn or cut *even to a thread*.

(*b*) *Right side of Calico.*—In specimen patches the right side of the calico must be noticed, but in practical patching this need not be considered *except the material be twilled*, as the first washing makes the difference (which depends solely on the dressing of the calico) imperceptible.

(*c*) *Folding of Patch.*—Fold the *selvedge* sides of the patch first and *stretch* them as far as possible, then fold the weft sides and avoid stretching them.

(*d*) *Placing of Patch.*—The chief difficulty in calico patching seems to lie in the placing of the patch evenly. As aids to this the

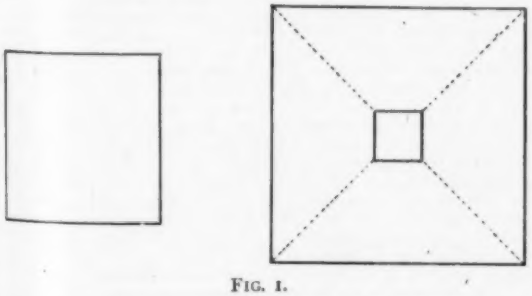

FIG. 1.

garment may be (*a*) creased diagonally (see Fig. 1), (*b*) garment and patch creased both perpendicularly and horizontally (see Fig. 2), or (*c*) crease both garment and patch *horizontally*, and having marked the width, draw with the point of the needle two straight

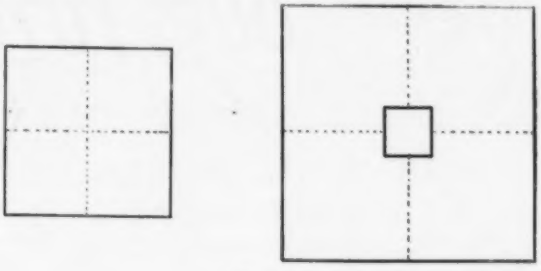

FIG. 2.

lines *selvedge way* to denote the exact place where the edges of the patch are to be (Fig. 3).

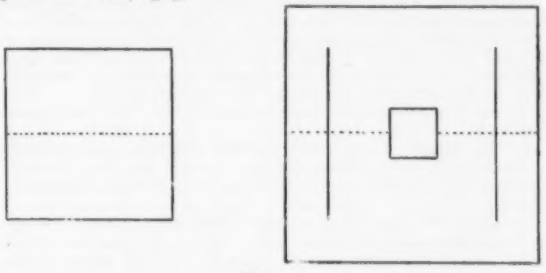

FIG. 3.

(*e*) *Stitches used.*—Seaming and hemming are the two stitches generally used in calico patching. On muslin, hemming *alone* is used, and running is sometimes substituted for the seaming.

Seaming, being the *stronger* of the two stitches, should rest on the *patch* and therefore it is used for the smaller or inner square.

Hemming, being the *lighter* stitch, should rest on the somewhat worn garment, and is used on the larger or outer square.

Commence both seaming and hemming at the *centre* of one of the sides, and finish both seaming and hemming by slipping the needle in between the patch and the garment and drawing it out so as to avoid showing the join.

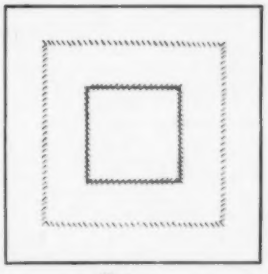

FIG. 4.

(*f*) *Width of Fell.*—The width of the fell on the space between the seaming and hemming is generally ¾ of an inch, but it may be less or more according to the size of the patch (Fig. 4).

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OUR TUTORIAL SECTION

OUR L.L.A. COURSE.

HONOURS EDUCATION.

BY THOS. CARTWRIGHT, B.A., B.SC. (LOND.)
Author of 'Mental Science and Logic for Teachers,' and of 'The L.L.A., What it is and How to Get it.'

QUICK'S REFORMERS, 144—end.

(1) **Jacotot.**—When it has been settled **what is to be done and why** a knowledge of the methods available adds greatly to a teacher's power. Jacotot supplied a method which, however, was referred to principles, hence he was more than a methodizer, although his chief claim to consideration rests upon his method. With respect to Jacotot's principles, it is important to note that, paradoxical as they are, still they express a kernel truth which Mr. Quick lays bare.

(1) **All human beings are equally capable of learning.**—Not so; but there is this much of truth in it, viz., that learning depends upon will, so that 'where there is no will there is no capacity.'

(2) **Everyone can teach; and, moreover, can teach what he does not know himself.**—Not so; but anyone can put others in the way of learning what he himself does not know. This is very different from teaching. This Quick shows respecting (1) **Facts** (2) **Science** (3) **Arts**. Furthermore, in emphasising the need for the pupil to become a self-teacher the paradox is valuable. The teacher as a **benevolent superintendent** comes under this: it further agrees with Spencer's advice that self-dependence should be encouraged to the uttermost. 'The highest and best teaching is . . . . **that which guides and encourages the pupils in working for themselves and thinking for themselves.**'

(3) **All is in all.**—This paradox calls attention to the need for (*a*) thoroughness, (*b*) repetition, and (*c*) continuity. It also clearly points to the existence of an associative law of which the learner cannot make too much or too frequent use; for 'there are a thousand links by which we may bring into connection the different subjects of knowledge,' hence 'the pupil must learn something thoroughly and refer everything to that.' Thus Jacotot is a **Complete Retainer,** concerning which the aphorism, that 'every way is good but the tiresome way,' should be pondered over, for your complete retainer will have much to do to escape the rock, tedium.

Also forgotten knowledge is not without fruit, since it **has modified mind** at the time of its acquisition, and mind modification is more important than knowledge, since it makes the acquisition of knowledge much easier than it was prior to the modification.

Steps in thoroughly learning and referring other things thereto (Il faut apprendre quelque chose et y rapporter tout le reste). (1) **Learn,** (2) **Repeat,** (3) **Reflect,** (2) **Verify.**

How the **method of investigation** which is really the method advocated by Jacotot, is exemplified in the acquisition of children and self-taught men. They proceed (1) from **objects** to **definitions,** (2) from **facts** to **reflections** and **theories,** (3) from **examples** to **rules,** (4) from **particular observations** to **general principles.**

'For Jacotot, I think, the claim may, without presumption, be maintained that he has, beyond all other teachers, succeeded in coordinating the **method of elementary teaching with the method of investigation.**

(2) **Spencer.**—Having dealt exhaustively with Spencer in the first paper of this series, we need only draw the attention of students to the fact that every word of Mr. Quick's criticism should be carefully read in connection with a revision of the 'Education.'

(3) **Thoughts and Suggestions—Want of an ideal.**—This is felt most in middle class schools, and where classics and mathematics are unsuitable because 'their pupils are too young to have much capacity for mathematics, and they will leave school too soon to get any sound knowledge of classics.'

Hard work should be imposed upon the children by way of discipline for the after life in the world: this does not mean overwork, but simply application to the uninviting, for which interest must be created of a secondary kind (see the foot-note on p. 473, wherein Wordsworth's opinion is to be found).

The remarks on younger children are hardly applicable now-a-days when nearly every infants' school could, on occasion, produce its Dr. Vater, whose method of teaching reading, by the way, would have infinitely more chance of success in a German school with a phonetic language than in an English school with its language of anomalous spelling. Still the **phonic system** is everywhere used in good English schools to the fullest possible extent.

Number—Grammar—Reading.—Nothing need be said on these points except perhaps to strongly recommend **silent reading,** followed by questioning on what has been read. **History**—Compare what Spencer says on this subject with what Quick says. **No epitomes.**—This is a very necessary prohibition, for in assimilating the fullest particulars should be at hand as a help to the understanding, and after complete understanding has been arrived at, then should come the time for a self-made epitome as a reminder of what has been learnt. **'Every student knows that the use of an epitome is to systematise knowledge and not to communicate it,' and yet in teaching we give the epitome first, and allow it to precede, or rather to supplant, the knowledge epitomised.** 'Books for a beginner should contain a **little matter in much space.**' A good example of this would be afforded by Dr. Arnold's suggested historical primer, the price of which, however, would be entirely prohibitive.

(3) **The Schoolmaster's Moral and Religious influence.**—That the schoolmaster should be first and foremost a moral trainer, employing judiciously precept and always giving a good example, is a truth finding expression in the works of every writer on education, and all that Quick says on the subject has already been said in the preceding pages. It is questionable whether children do 'form their opinion of a man from the worst they see of him.' It is more likely that they take the good with the bad and strike an average. The *open* is certainly preferable to the reserved, and we are of opinion that the good master should not pose as an Admirable Crichton but as a man 'with like failings.' That religious instruction should be given is the wish of the bulk of English people, and in the primary school a much more complete scheme is provided for this than in the public school. The influence of the older and more assertive boys is undoubtedly a very great factor in determining the tone of a school, and the wise master makes good use of this by getting the upper part of the school on his side, and by taking infinite pains to make their influence a good one. The connection of religious instruction with 'worship' is a real one, and no one will gainsay Quick in his condemnation of intellectual blinkers. To be bigoted is to be blind and unjust, and nothing is more detestable than to convert children into biassed observers of one side only of a case. **Reverence and humility** are two excellent things for a youth to be provided withal, and 'he may be taught to reflect how infinitely greater the facts of the universe must be than our poor thoughts about them.' Formularies should in our opinion come latest and last, when the mind is in some degree capable of realising that there is another side, and so give not undue weight to the formularies.

(4) **Conclusion.**—The *resumé* given here should be very carefully read and remembered, as it constitutes a valuable aid to revision. Some parts to be committed to memory, are—(1) It would be better for a boy to learn nothing at all than to be taught such-like books by such-like masters (Rabelais). (2) The greatest clerks are not the wisest men (Rabelais quoted by Montaigne). (3) 'We labour to stuff the memory, and in the meantime leave the conscience and understanding impoverished and void.' 'Tis not a soul, 'tis not a body, that we are training, but a *man*, and we ought not to divide him' (Montaigne). (4) 'Every act of teaching is a mode of dealing with mind, and will be successful only in proportion as this is recognised' (Jn. Payne). (5) 'The true end of all human learning is to supply in ourselves and others the defects that proceed from our ignorance of the nature and use of the creatures and the disorderliness of our natural faculties in using them and reflecting upon them' (Dury). (6) 'The great function of the educator is according to him (Locke), not to *teach*, but to *dispose* the pupil to virtue first, industry next, and then knowledge.' (7) 'Childhood is the age of strong impressions from without, and its material surroundings affect it much more acutely than they will in after life.'

(8) 'The study of Nature shows us that every animal comes into the world with certain faculties or capabilities. There are a set of circumstances which will develop these faculties and make the most of them. There are other circumstances which would impede this development, decrease it, or even prevent it altogether . . . . We have to consider what are the inborn faculties of our children, and also what aids and what hinders their development.'

'The child from his earliest years is to be treated as a *doer*, and even as a *creator*.' (9) The old education had one object, and that was learning. Man was a being who learnt and remembered.'

'The success of the education is not determined by what the educated *know*, but by what they *do* and what they *are*. They are well educated when they love what is good, and have had all their faculties of mind and body properly developed to do it.' The appendix should be read and the various addenda should be carefully placed in their proper place. The quaint *causerie* should be found very interesting as well as profitable.

II. Arnold's Higher Schools and Universities in Germany.

The two prefaces must be studied as a question on the second preface has appeared twice. The chief points in the first preface are, (1) public elementary education need not be secular, (2) it ought to be compulsory, for wherever there is a good regard for education this good regard impels the community to make education compulsory; further, not only should the masses be compelled to see to the education of their progeny but so in like manner should the classes. Then follow three points concerning middle-class education, to which Mr. Arnold calls attention: (1) the middle-class children on the Continent are educated on a higher plane than here in England; (2) special schools are only possible where there is a good graduated system of ordinary schools. Before the special education should and must come the good ordinary education. (3) In our fear of being too much governed we make it impossible for the talent of the nation to be used on our behalf as it otherwise might be. Our high opinion of our energy and our dislike for the powers that be are obstacles in the way of a successful realisation of what is needed in the matter of middle-class education.

The **preface to the 2nd edition** speaks of the great and increasing interest in the history of education on the Continent, and avers that the main lines of development of educational policy in Germany are just the same now as when the book was written. 'There is, indeed, an increasing demand everywhere for modern or oral studies, as they are called, and the school course is being modified everywhere in compliance with this demand.' The thing is that the balance between the old and the new, between classical studies and the study of modern languages and science should not be destroyed. This is not likely to be the case in Germany. School fees, says Mr. Arnold, are higher in Germany now than when he first wrote, but still secondary education is much cheaper there than in this country.

In **1783,** on the invitation of Von Zedlitz, Minister of Public Worship under Frederick the Great, was initiated the change to which is to be mainly ascribed the excellence of the Prussian school system, distinguished as it is by **life, power,** and **faith** in its own operations.

Present Organisation of the Secondary or Higher Schools in Prussia.

(1) Gymnasiums, (2) Progymnasiums, (3) Realschulen, (4) Höhere Bürgerschulen. (These latter have now become Realschulen). Compare this list with that given above.

The Gymnasium corresponds to our public school with its classical curriculum. The Realschulen correspond with our Schools of Science, in which modern languages and science predominate, Latin being however frequently taught. The **Lehrplan** is fixed by the ministerial authority, but much freedom is permitted as to detailed schemes in working this out. Note what is said as to forms and subjects, and that the Progymnasium is merely a gymnasium without their higher classes. Note the connection between Comenius, &c., and the Realschule, a name first used at Halle in 1738. In 1859 a **Lehrplan** for Realschulen was devised. The hours are longer in the gymnasium, and all three kinds are for boys destined for callings for which university studies are not required. Although Latin is still required only in those of the first rank, English and French are compulsory.

Before commencing the study of the first chapter of Mr. Arnold's book it is desirable to point out that Mr. Sadler, Director of Special Inquiries and Reports, has recently published some lucid accounts of the Prussian secondary schools which the student would be wise to read. An article on the First Book of Reports appeared in the Oct. ('97) No. of the PRACTICAL TEACHER. Here we can only give the list of Prussian Secondary Schools as now existing :—

I. Classical Schools.
- (i) Gymnasium (9 years course).
- (ii) Progymnasium (6 years course).

II. Modern Schools.
- (*a*) With Latin.
  - (i) Realgymnasium (9 years course).
  - (ii) Realprogymnasium (6 years course).
- (*b*) Without Latin.
  - (i) Oberrealschule (9 years course).
  - (ii) Realschule (6 years course).

Arnold, Chap. I. Development of the German Secondary or Higher Schools. The Renascence and the Reformation worked hand in hand for the furtherance of classical education. In Germany the best spirits of the Renascence were reformers, not so in England; but theology in time starved the classics, and so, says **Wolf,** 'The schools will never be better so long as the schoolmasters are theologians by profession.' Vorschulen would be very useful in giving the teacher a chance to link the more elementary instruction with the more advanced. All these schools are **public,** all subject to **State inspection,** all must have a **public audit** of accounts, all must have masters properly **qualified and certified.** Note the comparison as set out in the preface between the proportion of English and Prussian public school scholars.

Chap. III. Government and Patronage of the Prussian Public Schools.—'Public control of the higher schools is exercised through administrative orders and instructions like the minutes of our Committee of Council on Education.' Make an epitome of the orders given. The administration is made **as local as it possibly can be.** The State has always been an important **patron** of schools, and care has been taken to keep all the power, so that public schools are not able to be self-controlled as with Eton, etc. In addition, the State has gradually increased its power thus: (1) General Directorium 1722. (2) Oberschul collegium 1787. (3) Education Department, 1812, with **Humboldt** at its head. (4) Education Department became independent 1817, Altenstein becoming the first minister who, with 8 technical advisers, constitute the central authority for the affairs of education. 'But in Prussia it is not the central minister who has the most direct and important action upon the schools, **it is the authorities representing the State in the several parts of the country.**' Humboldt established the 'fruitful relation' between the central and local authorities. The objection to the **consistories** was (1) their disconnection with the Education Department, and (2) their lack of control over Catholic schools. Hence the 26 **Regierungen** 1808, to which in 1810 were added 3 Scientific Departments to examine teachers and advise the Government. In each of the 8 Provinces there is a **Provincial Schulcollegium** through which the State acts in connection with secondary education. In each of the 26 Regierungen there is a District Board. The control is divided as follows :—

Provincial School Board.	District Board.
(1) Gymnasien.	(1) Smaller Progymnasien.
(2) Progymnasien (the larger only).	(2) Realschulen other than the first rank.
(3) Realschulen of the first rank.	(3) Higher Burger Schools.
	(4) Primary Schools.

Seven Examination Commissions have replaced the Scientific Deputations. There is one member for each of the 7 subjects in which secondary teachers are examined.

In addition there is a municipal administration for non-Crown patronage schools who administer **externa,** that is, business matters relating to the endowments and school finances and property.

Interna, that is, matters relating to the internal administration of the schools coming under the control of the Provincial and District Boards. Externa and interna of all Crown patronage schools come under these two Boards; but '**Wherever there is an endowment, there is a public right to see that this endowment is properly employed.**' The State is patron or part patron of the greater part of the schools. Only 12 schools exist under private patronage. These follow the Lehrplan, etc. For every school there is an ordained authority of supervision.

Chap. IV. Preponderance of Public Schools.—The Abiturientexamen (leaving examination). A question on this learning examination is certain to be set. **Its History.** Before 1788 admission to the university was very easy. Consequently the universities 'were cumbered with unprepared and idle students.' In Dec., 1788, public schools were enjoined to submit their boys to an examination test before they proceeded to the university. Students from private schools were to be examined by the university. Certificates of Ripeness or Unripeness were to be given as a result of this examination. In 1794 this power of examination of private

school students was taken from the schools and given to a commission, and the examination was to be more strict; but the schools made the standard high in order to retain the scholars, whereas the universities were notoriously much lower. Humboldt strictly defined the examination, and three classes of passes were instituted, of which only No. 1 was declared qualified for the university. In 1834 and 1856 the leaving examination was given entirely to the Gymnasium, and the candidate is declared 'ripe' or 'unripe,' the former being able the latter unable to make attendances counting for a degree course at the university. 'The examining body is thus constituted: the director of the Gymnasium, and the professors who teach *in prima;* a representative of the Abue-curatorium, where the Gymnasium has a Curatorium; the joint patronage secretary where there is one, and the member or delegate of the Provincial School Board, who is always president.

The Abiturient must have been two years in prima, be examined in German, Latin, Greek, and French; mathematics and physics, geography, history and divinity, and, if about to enter the theological faculty, in Hebrew. The examination is both written and *viva voce*, the former lasting over a week, and each performance is marked *insufficient*, *sufficient*, *good* or *excellent*, and no other terms, and no qualifications of these are admitted. A candidate who is fully up to the mark in another tongue and in Latin, and considerably above it either in classics or mathematics, is declared *reif*—passes—though he may fall below it in other things . . . . Each member of the examining commission signs the certificate, which, besides defining the candidates proficiency in each of the matters of examination, has three additional rubrics for *conduct*, *diligence*, and *attainments*. 'Unreif' may not count this time at a university for a degree, and may only be examined, once more going to a gymnasium for the purpose.

This leaving certificate is the passport to the Civil Service, and to the Universities; hence the church, law, medicine, and higher teaching can only be qualified for by first passing the Abiturientenamen *externi* pass a similar examination, but are more leniently treated than the Abiturienten. The aim is to secure attendance at a good public school for a period sufficiently long for the school to have had time to give the student the main beginnings of a liberal education; hence mere ability to pass examination is considered insufficient without a guarantee of previous training and discipline.

The Realschulen and the Bürgerschulen have each their own leaving examination, which, since 1832, has, to some extent, been recognised as qualifying for entrance into the civil service. The subjects are: Divinity, German and its literature, Latin translation, French, English, ancient history, history of Germany, England, France, for the last three centuries; Geography, Physics, Chemistry; pure and applied Mathematics; Drawing. The leaving certificate of a Bürger Schule qualifies the holder for entrance into a Realschule of the first class, and a certificate is granted to the scholar who passes the examination qualifying him to pass from *secunda* to *tertia* of the school. 'Young men who volunteer to serve for one year in the army, and clothing themselves, the term of military service to be then at an end, must, to be accepted, produce a certificate of a certain value, either from a Gymnasium or a Realschule.' The whole of this chapter should be very carefully got up.

Chapter V.—*The Prussian Schoolmasters: their training, examination, appointment, and payment.* Of these subjects the first is by far the most important. Note that three great educational reforms to be set to the credit of Humboldt: (1) The Lehrplan; (2) The Maturitätsprüfung, *i.e.*, the leaving certificate of ripeness as a condition of admission to a university as a student, whose attendances may count for a degree; (3) The Staatsprüfung, or the training examination of the secondary teacher (1810). At first this consisted of an examination and a trial lesson, which in 1826 was enlarged into a Probejahr; in 1827 persons in orders, as well as ordinary candidates, were required to pass the special examination, and to go through the special training for schoolmasters, 'a policy which **Wolf** had long before done his best to prepare, and had declared indispensable if the higher schools of Prussia were to be made thoroughly good—**the policy of making the schoolmaster's business a profession by itself,** and separate it altogether from theology.'

'The candidate sends in his school certificate of fitness for university studies, and his certificate of a three years' attendance at university lectures. With these certificates he forwards to the commission a *curriculum vitæ*.'

The candidate for the gymnasium writes this in Latin; the candidate for the Realschule may write in French. The certificate given takes the form of a *facultas docendi*, or leave to teach; and this is conditional or unconditional. The matters for examination are grouped under four main heads: (1) Greek, Latin, and the mother tongue; (2) Mathematics and Natural Science; (3) History and Geography; (4) Theology and Hebrew. 'All must show some acquaintance with philosophy and pædagogic. Candidates for the unconditional *facultas docendi* a very considerable acquaintance; and all must satisfy the examiners that they have some knowledge of the natural sciences.' Arnold's footnote *re* pædagogic must not be taken much account of. He simply expresses the ordinary English opinion of his time as to the theory of education. Since then a more enlightened view of the subject is taken, and 'much nonsense' is now happily talked in England, and more is likely to be talked in the near future. Observe the special conditions applicable to the Realschule and the Bürgerschule, and even to the teacher of foreign languages, who 'must know as much Latin, History, Geography, and Philosophy, as is required of candidates who are to teach in the middle division of a Gymnasium. **Wolf's** objection to the exemption granted to a doctor was a wise one, for the well-known reason that a good scholar may be a very bad teacher. The Probejahr would act as a mild corrective to this, but it would be much better to insist upon the graduate passing the professional part of the examination. Normal schools are not regarded as of great importance, although time passed therein counts off the Probejahr. 'The pædagogical seminaries have not been so fruitful to him as the philological seminaries, 'where he is taught the systematic knowledge of classical antiquity. Note *Wolf's* connection with the Halle Philological seminary, and how he proceeded.

The Natural and Historical Science Seminaries at Bonn, and the seminaries connected with other universities, must be regarded as special training schools for teachers in special branches of knowledge.

The pædagogic seminaries 'that introduce him to the practical arguments of the profession of schoolmaster' were a set-off against the Probejahr. It is not surprising that the masters did not yearn for the introduction of probationers into their schools, and the selection and special payment of men to do this work would be a better and a more equitable arrangement. Nothing need be said about the terms of appointment, but a word of approval must be given to the provisions whereby unjust dismissal was to be guarded against; 'a disposition to take security against the immediate and arbitrary action of the executive' is greatly to be encouraged. The demand for a Minister of Education is still unsatisfied; indeed, at the present time, the Vice-President of the Council, who is all we have for Minister of Education, is not even included in the Cabinet. It does not follow that a Minister of Education in England would have the power to become a Von Mühler, and even in his case public opinion was too much for him. What would it have been in England?

The arrangements for religious instruction are comprehensive, and on the whole just. The exact meaning of the terms 'Oberlehrer' and 'Ordentliche Lehrer' should be carefully noted. As concerning the salaries, it must be remembered that money has a much greater purchasing power in Prussia than in England, and the master there is probably as wealthy as his English colleague, whose income may nominally be half as big again. This is shown plainly by the contentment of the schoolmasters themselves.

Notes and Criticisms.

As to Jacotot, a question on this chapter will certainly be set, and not only must the paradox be stated, but also the underlying principle must be laid bare, as is done by Quick. Interesting as are the concluding chapters, they have not formed matter for questions in previous years. This does not, of course, make it certain that no question may be expected in 1898, although it is highly probable that such will be the case.

Arnold.—Note that questions on the *Prefaces* are set, and that the question on the organisation of Prussian Secondary Schools, the Abiturientenexamen, the training of the Prussian schoolmaster, and the work of particular schools, such as the Friedrich Wilhelm school, appear again and again. They may certainly be expected in the coming examination. By way of novelty, a question on **Humboldt** may be given this year, hence the wise student will get together the various sections to be dealt with this famous administrator. Very little difficulty will be experienced in reading Arnold, nor will it be difficult to remember what he recommends. Next month we shall deal with the remaining chapters of this book, as well as giving some *résumé* notes on the whole course.

Questions on Quick.

1. Describe fully, and discuss the ideas and methods of Jacotot. (1892.)
2. Write a summary of the chapter on Jacotot. (1893.)
3. Explain fully the following phrases:—'Intellect based on the Senses,' 'Do the opposite to the usual,' 'Rendering the inner outer,' 'No epitomes,' 'Capitalise ideas.' (1894.)
4. State, explain, and illustrate the main principles on Jacotot. (1895.)

Questions on Arnold.

1. Describe the present organisation of secondary schools in Prussia. (1888, 1891, 1892, 1893, 1894, 1895, 1896.)

2. Explain fully the nature of the leaving examination in the different kinds of schools. (1888, 1892, 1894, 1895.)
3. Describe the training of the Prussian schoolmaster. (1888, 1890, 1891, 1892, 1893, 1894, 1895, 1896.)
4. Write a short summary of the 'Preface to the second edition.' (1890, 1892, 1893.)
5. Give a full account of the work done in a Prussian Gymnasium. (1890.)
6. Write a short *résumé* of the chapter on the Abiturienten Examen. (1890.)
7. State and comment on 'Wolf's great rule.' (1890.)
8. Who was Wolf, and what did he do for education in Prussia?
9. Comment upon this: 'Perversé studet qui examinibus studet' (He who studies for examinations, studies unwisely).
10. Give a short account of the work done in the chief Gymnasia of Germany (compare 5). (1892.)
11. State Mr. Arnold's arguments with respect to compulsory education. (1893.)
12. Write an account of the Friedrich Wilhelm Gymnasium (compare 5 and 10). (1893.)
13. Write a summary of the chapter on 'The Prussian System as seen in operation in particular schools.' (1894, 1896.)
14. Write a summary of the 'Preface to the First Edition.' (1896.)

Students are recommended to get '**Mental Science and Logic for Teachers**' written by the author of these articles, and published by Messrs. Nelson & Sons at 2s. 6d. They will find in this book all that is needed to make them understand the references to the development of faculty and other psychological points upon which the student is likely to be weak.

Students sending in work will save a post by writing direct to Mr. Cartwright, 31, Park Hall Road, E. Finchley, London, N.

LONDON MATRICULATION.

June 1898.

BY R. C. B. KERIN, B.A. (LONDON),

First in First Class Classical Honours at Final; Principal, Carlyon College, 55 & 56, Chancery Lane, W.C.,

AND

E. J. SCHWARTZ, M.A., B.SC.,

Late Scholar of St. Catharine's College, Cambridge.

LATIN.

Course for May.

1. Vergil.—Revise Book I. 500 to the end and Book II.
2. Grammar.—Learn (1) Oratio Obliqua, (2) Temporal Clauses, (3) The Calendar, Money, and Roman Names, (4) Formation of Inceptive, Desiderative, Diminutive, and Frequentative Verbs, Patronymics and Diminutive Nouns—

Revise (*a*) in the Accidence the Declensions of Nouns and Adjectives, (*b*) in the Syntax the Cases oft he Pronouns.

3. 'Anglice Reddenda.' 115–125.
4. Sentences from Bradley's Arnold or Bayfield and Allen's 'Exercise Book.'

Latin Grammar Notes.

The definition of Oratio Obliqua is very important. Three changes occur in passing from Oratio Recta to Oratio Obliqua—(1) Mood; (2) Person; (3) Tense. The verb in the principal clause as a rule becomes the infinitive; the imperative, however, becomes the subjunctive, and questions are put in the subjunctive, if they are real questions and in the 2nd person. The verbs in the subordinate sentences are put into the subjunctive. The tenses of the subjunctive are usually secondary. The 1st and 2nd persons in Oratio Recta become the 3rd person in Oratio Obliqua.

The following passages of Oratio Recta and Oratio Obliqua are taken from the elementary Latin grammar by Professors J. Roby and A.S. Wilkins (Macmillan). Students will do well to go over these passages carefully.

ORATIO RECTA.—Si pacem populus Romanus cum Helvetius faciet in eam partem ibunt atque ibi erunt Helvetii ubi tu eos constitueris; sin bello persequi perseverabis reminiscetor et veteris incommodi populi Romani. Quod improviso unum pagum adortus es ne ob eam rem aut tune magnopere virtuti tribueris aut nos despexeris. Quod si veteris contumeliae oblivisci volo num etiam recentium iniuriarum quod me invito iter per provinciam per vim temptastis quod Aeduos, quod Ambarros, quod Allobrogas[vexastis memoriam deponere possum?

ORATIO OBLIQUA.—*Si pacem populus Romanus cum Helvetiis faceret in eam partem ituros atque ibi futuros Helvetios ubi eos constituisset: sin bello persequi perseveraret, reminisceretur et veteris incommodi populi Romani. Quod improviso unum pagum adortus esset, ne ob eam rem aut suae magnopere virtuti tribueret aut ipsos despiceret. Quod si veteris contumeliae oblivisci vellet num etiam recentium iniuriarum quod eo invito iter per provinciam per vim temptassent quod Aeduos, quod Ambarros, quod Allobrogas vexassent, memoriam deponere posse?*

The Numerals.

Dates, too, are important.

Note the following typical cases:—

March 1. KALENDIS MARTIIS.....Kal. Mart.
March 3. Ante diem quintum Nonas Martias.....a.d.v. Non. Mart.
March 7. NONIS MARTIIS.....Non. Mart.
March 10. Ante diem Sextum Idus Martias...a.d. vi. Id. Mart.
March 14. Pridie Idus Martias.....Prid. Id. Mart.
March 15. IDIBUS MARTIIS.....Id. Mart.
March 23. Ante diem decimum Kalendas Apriles.....a.d.x. Kal. Apr.
March 31. Pridie Kalendas Apriles.....Prid. Kal. Apr.

Remember the rhyme for the date of the Nones and Ides:—

'In March, July, October, May,
The Nones are on the seventh day!'

The Ides are then on the 15th.

Note that *before* 45 B.C., March, July, October, and May had 31 days, February 28 or 29, and the rest had only 29, not 30. Remember this if the date given to you is then in a year preceding 45.

The year is expressed by the *ordinal*, and not by the *cardinal*—*e.g.*, 154 A.U.C. (*ab urbe condita*) is *anno centesimo quinquagesimo quarto ab urbe condita.*

Note how to express 51 B.C.—*anno septingentesimo tertio anno ab urbe condita.* Rome was founded in 753. Now, 753 − 51 + 1 = 703. Therefore 51 B.C. is the seven hundred and third year from the foundation of the city. Note that you have to add one after subtracting.

Note that 'on March 10' is *ante diem sextum Idus Martias*—'before March 10' is *ante ante diem sextum Idus Martias.* All such expressions as *ante diem sextum Idus Martias* were regarded as nouns, and any preposition can be used before them.

It is also important to know the fractions of the *as*, as they are used in denoting the portion of an inheritance received; and, also, in calculating interest—*e.g.*, *heres ex semisse patri factus est*, 'he was left heir to half his father's property,' 'he lent him 800 sesterces at 2 per cent.,' *ei octingentos sestertios mutuos sextante dedit.*' The *as* was regarded as 1 per cent. per month—*i.e.*, 12 per cent. per annum; therefore *sextans* = ⅙ as is ⅙.12 per cent.—*i.e.*, 2 per cent. The interest is put in the ablative.

With regard to sesterces, note the following types:—

1,000 sesterces = *mille sestertii.*
2,000 ,, = *duo milia sestertium* (gen. plural), or *bina sestertia.*
2,000,000 ,, = *vicies* (*centum milia*) *sestertium.* (*Sestertium* is here irregularly regarded as a single neuter noun, and declined accordingly, though it is really the genitive plural.)
2,320,455 ,, = *vicies ter* (or *trecenta*) *viginti milia quadringenti quinquaginta quinque sestertii.*

Note that 1,000 H.S. = £8 10s. If you are given English money, you must turn it into Roman money, and then translate.

Sentences for Practice.

1. If you had asked him what he would have done at such a crisis (*discrimen*) as this, he would not have been able to tell you.
2. If he had gone to Rome without telling his father, I should have blamed him.
3. On March 10, 55 B.C., his brother set out from Rome and reached Capua before March 13.
4. There can be no doubt that he was left heir to half his father's property.
5. If you were to ask him how much twice four were, he would object (*nolo*) to tell you.
6. On hearing that the city had been burnt by the enemy on April 5, he immediately called together his soldiers, and exhorted them to march with all speed to avenge (*ulciscor*) their friends.
7. Some said they were unable to go to Rome; others said they would not go even if they could.
8. It cannot be denied that he was too brave to desert his citizens when the enemy were attacking the town.
9. We must prevent him from sacrificing himself for his friends (use *antepono*, and translate 'prefer his friends to himself').
10. We cannot tell you whether he has gone to Rome or Capua. We know, however, that he is not in Delos (island).

Solution of Sentences given last month.

1. Utrum copiae advenerint necne invenire ad nos omnes attinet.

2. Alii ne hostium copiae mox adessent timebant ; alii eos ex urbe Thebis excessisse non putabant.

3. Quid faciat ? Adorienti hosti non diu resistere posse constat.

4. Nostrum quisque ut patriam suam conservet niti debet.

5. Non est cuiusvis haec talia pericula sine timore subire.

6. Dux se militum seditiosissimum quemque interfecturum est minatus nisi consilia sua sine mora confecissent.

7. Tantum abest ut amicum meum laudet ut ultro eum culpare constituerit.

8. Si de Caesaris morte certiores facti essemus, hunc interficere non dubitavissemus.

9. Si patrem tuum visum eas, cur Corintho abiverit non tibi dicat.

10. Dum milites haec faciunt, hostes adveniebant.

Typical Sentences.

32. If he had said that Marcellos was the third who won the Spolia Opima, he would not have been blamed by your friend.

Si Marcellum Spolia Opima tertium tulisse dixisset ab amico tuo non culpatus esset.

Notes.—(*a*) Subjunctive with *si* because *culpatus esset* is in the subjunctive. The subjunctive pluperfect is used to express 'would have' in English. See previous rules.

(*b*) Note how to translate the English Ordinal as a complement of the verb 'to be.' *Tertium fuisse qui* would be an incorrect rendering of the English.

(*c*) Remember not to leave out the preposition with the agent.

(33) Most people thought that if news of Caesar's victory had not come at that very time, the enemy would have taken the town.

Nisi eo ipso tempore nuntii de Caesaris victoria essent allati, plerique hostes oppidum fuisse capturos existimabant.

Notes.—(*a*) The apodosis in this sentence is not 'most people thought,' but 'would have taken.' We have seen before that 'would have' in a principal clause is expressed by the pluperfect subjunctive. It is not permissible here, however, to use the pluperfect subjunctive, as the 'would have' sentence is introduced by 'that' and depends on a verb of 'thinking,' which requires the infinitive. Now 'would have' when the infinitive is required is expressed in two ways: (1) If the verb is active and has a supine, by the future participle with *fuisse ;* (2) by *futurum fuisse ut* and the imperfect subjunctive, if the verb (*a*) has no supine, or (*b*) is passive. Hence above we have *capturos* (agrees with *hostes*) *fuisse.*

(*b*) *Venissent* is in subjunctive because the apodosis if in Oratio Recta would be in the subjunctive.

(*c*) 'Of' when equivalent to 'concerning' is often translated by '*de.*' With verbs it is generally translated in this way, *e.g.*, 'I speak of him,' *de eo loquor.*

(*d*) Distinguish *plerique*, 'most people,' from *plurimi*, 'very many.'

34. No one asked what Caesar would have done, if he had heard that the city was within an ace of being captured.

Nemo quid Caesar facturus fuerit rogavit, si haud multum abfuisse quin urbs caperetur audivisset.

Notes.—(*a*) The apodosis to the 'if' clause is again in a dependent clause, viz., in an indirect question clause depending on *rogavit.* The *apodosis* containing 'would have' would in Oratio Recta be pluperfect subjunctive; ∴ according to the rule the verb in the 'if' clause is in the subjunctive, hence we write *audivisset.*

(*b*) In dependent questions and in consecutive clauses (that is, in clauses expressing result, introduced in English by 'so that') 'would have,' if the verb is active, is expressed by the so-called periphrastic subjunctive (*i.e.*, by the future participle and the perfect subjunctive of *sum*). Hence above we write *facturus fuerit.*

(*c*). Note how to express 'within an ace,' lit. 'it was not much absent but that.'

35. We said that if we had ordered you to go to Rome, the town would not have been lost.

Si tibi ut Romam ires imperavissemus futurum fuisse ut oppidum amitteretur negavimus.

Notes.—(*a*) The subjunctive *imperavissemus* is used as before, because the apodosis is 'would have been lost.'

(*b*) 'Would have been lost' has to be translated by the infinitive, because verbs of 'saying' require the infinitive when in English there is a 'that' clause or its equivalent. Now 'would have been,' when the infinitive is required, is translated by *futurum fuisse ut* and the imperfect subjunctive passive, in accordance with the rules given above.

(*c*) Note that in English where we say, 'say . . . . that not,' the Latins place the negative with the verb of saying, and use *nego*, lit. 'deny that.'

(*d*) Be careful not to use the infinitive after *impero*, 'order.' The only verb of ordering that normally requires the infinitive is *iubeo.* Be careful, too, not to use the accusative with *impero.* The person to whom an order is given is put in the dative, the thing that is ordered is put into the accusative.

36. I should not hesitate to say that all wise men are always happy, if your friend were able to convince me that men can be always happy.

Non dubitem dicere omnes sapientes semper esse beatos si amicus tuus homines semper esse beatos posse mihi persuadere possit.

Notes.—(*a*) The present subjunctive is used in both clauses, because (i.) there is a 'should' in the apodosis, (ii.) the condition refers to future time.

(*b*) *Non dubito*, '*I do not doubt*,' followed by a 'that' clause requires *quin* and the subjunctive in Latin. When, however, *Non dubito* means 'I do not hesitate to,' use the infinitive in Latin, as in the sentence above.

(*c*) *Persuadeo* governs the dative.

(*d*) When '*persuadeo*' is followed by an infinitive in Latin, it means to 'persuade' or 'convince a person that a thing is so. When it is followed by *ut* and the subjunctive, it means to persuade a person to do a thing.

FRENCH.

Course for May.

1. A certain amount of translation and a certain amount of exercises from English into French each week.

2. In the Grammar revise the formation of the plural and the feminine ; the rules for gender ; the formation of the comparisons of adjectives ; the numerals ; and the pronouns.

ENGLISH.

Course for May.

(1) Grammar.—Read the chapters dealing with prefixes and suffixes. The significations of prefixes and suffixes are important, especially those of Teutonic origin. Read the chapter on Prosody. A question is often set on this subject.

Trace the development of the English language, note the various dialects of Old English, and the meaning of the term Anglo-Saxon. The Mercian dialect, remember, and not Anglo-Saxon (which is another name for the Wessex dialect), is the ancestor of modern standard English. Before the Conquest Anglo-Saxon was the most important dialect. Note that the two chief characteristics which distinguish old from modern English are that (1) it was a synthetical language, (2) its vocabulary was *pure*, while ours is mixed.

After the Norman Conquest we still find three leading dialects—the Northern, the Midland, and the Southern. Note the causes which led to the predominance of the Midland dialect. Note the influence of the Norman Conquest on English. The stages of struggle between French and English should be traced. The sub-divisions of the modern period of English are important.

Revise Verbs, Adverbs, Prepositions, and Conjunctions. Read through the chapters dealing with Analysis and Parsing.

MATHEMATICS.

GEOMETRY COURSE.

May Course.

Euclid, Book IV. may be read, and at the same time a revision of Books II. and III.

Solutions to the riders of our April course.

1. Let AB be any chord of a circle centre C, then if C be joined to P the mid point of AB, by III. 3, CP will be perpendicular to AB. Now since equal chords of a circle are equidistant from the centre the lines joining C to their mid points will all be of same length, or the locus of the mid points will be a circle centre C.

2. Let P be any point on CP, and PD, PE tangents the circles whose centres are A and B respectively. Join PD.DA, PB.DE.

Then

$PD^2 = PA^2 - AD^2 = CP^2 + AC^2 - AD^2 = CP^2 + AC^2 - R^2$,

and

$PE^2 = PB^2 - BE^2 = CP^2 + CB^2 - BE^2 = CP^2 + BC^2 - r^2$.

Now $BC^2 - AC^2 = r^2 - R^2$;

$\therefore BC^2 - r^2 = AC^2 - R^2$;

$\therefore CP^2 + BC^2 - r^2 = CP^2 + AC^2 - R^2$;

$\therefore PD^2 = PE^2$ or $PD = PE$.

Riders for May :—

1. Prove the following construction for trisecting a right line AB.

On AB describe an equilateral triangle ABC, bisect the angles at B and A by straight lines BF and AF meeting in F, through F draw parallels to CA, CB meeting AB in D and E. Then AB shall be trisected in D and E.

2. Inscribe in a circle a triangle whose sides shall be parallel to three given straight lines.

3. To produce a given straight line HK to N so that rect. HN, NK may be equal to a given square.

4. Construct a rhombus equal in area to a parallelogram.

ARITHMETIC COURSE.

Chapters XXXVI. to XL. of Pendlebury may be studied, omitting however Cube Root.

Illustrative examples :—

1. What is the rate per cent. compound interest when £666 13s. 4d. amounts to £810 6s. 9d. in 4 years.

£1 in 1 year amounts to £R.

Then in 4 years

£666 13s. 4d. (= £666⅔) amounts to $666\frac{2}{3}R^4$.

Hence $666\frac{2}{3}R^4 = £810\ 6s.\ 9d. = 810\frac{27}{80}$;

$$\therefore\ R^4 = \frac{648\,27 \times 3}{80 \times 2000};$$

$$\therefore\ R^2 = \frac{441}{400};$$

$$\therefore\ R = \frac{21}{20},$$

or £1 in 1 year amounts to £$\frac{21}{20}$;

∴ £100 in 1 year amounts to £105,

or the per cent. required is 5.

2. A clock gains 2 minutes in every hour, it is correct at noon May 1st, what is the correct time when this clock shows noon May 2nd ?

62 minutes by this clock are 60 minutes by a correct clock,

∴ 62 hours " " 60 hours " "

∴ 24 " " " $\frac{24 \times 60}{62}$ " " "

= 23 hours 13 minutes approximately.

So that the correct time is 47 minutes earlier, *i.e.*, 13 minutes past 11.

We add a few questions :—

1. Find the price of 659 bales of cotton each weighing 1 cwt. 1 qr. 21 lbs. at £2 3s. 1½d. per cwt.

2. Find to 3 decimal places the value of

$$\sqrt{\frac{7}{5}} \text{ and of } \frac{1}{\sqrt{\cdot 4}}.$$

3. Calculate without the use of any rule the value of $\cdot 27\dot{9}$ in the form of a vulgar fraction.

ALGEBRA COURSE.

Chapters XXXIII. and XXXIV. of Hall and Knight may be read, and of the examples about every third one should be worked. These chapters are very important and should be carefully studied.

Illustrative examples :—

1. Factorize $1 + y(1 + xy)(1 + x)^2$.

$$1 + y(1 + xy)(1 + x^2) = 1 + y(1 + x)^2 + xy^2(1 + x)^2$$
$$= x(1 + x)^2y^2 + (1 + 2x + x^2)y + 1.$$

We now factorize by trial

$$x(1 + x)^2y^2 = x(1 + x)y \times xy,$$
$$1 = 1 \times 1;$$

so that the factors are probably

$$[x(1 + x)y + 1][xy + 1].$$

By trial these are found to be correct.

2. Insert 2 numbers between 3 and 18 so that of the 4 numbers thus formed the first three are in geometrical and the last three in arithmetical progression. Let the numbers be 3, $3r$, $3r^2$, 18.

Then $3r$, $3r^2$, 18 are to be in A.P. ;

$$\therefore\ 3r^2 - 3r = 18 - 3r^2,$$

or $$6r^2 - 3r - 18 = 0;$$

$$\therefore\ r = 2 \text{ or } -\tfrac{3}{2},$$

and hence the numbers are 3, 6, 12, 18, or 3, $-\frac{3}{2}$, $\frac{27}{4}$, 18.

3. Show how Euclid II. 5 proves that the arithmetic mean of two quantities is larger than their geometric mean.

If AB be a straight line divided evenly at C and unequally at D, Euclid II. 5 proves that

rect. AD.DB is less than BC^2.

Let now AD = a, BD = b, so that AB = $a + b$, and BC being half of AB is $\frac{a+b}{2}$;

$$\therefore\ ab \text{ is less than } \left(\frac{a+b}{2}\right)^2$$

or $$\sqrt{ab} \text{ is less than } \frac{a+b}{2}.$$

MECHANICS COURSE.

Loney's Chapters VIII. and IX. are to be studied and plenty of the examples worked, and the Hydrostatics may be continued by the reading of Chapters XXII. and XXIII.

Note that Boyle's law may be stated, 'The product of the pressure of a given quantity of gas multiplied by its volume keeps the same.'

Illustrative examples :

1. A balloon not fully distended is filled with gas occupying a volume of 1,000 litres, the height of the mercury barometer being 30 inches. The balloon rises to a region where the barometer shows only 20 inches. What will now be its volume ?

Here we start with 1,000 litres of gas under a pressure of 30, and end with a volume of v litres of gas under a pressure of 20. By Boyle's law,

$$20\,v = 30 \times 1000;$$
$$\therefore\ v = 1500 \text{ litres.}$$

2. What is the weight of air in a room 18 ft. long, 10 ft. broad, and 12 ft. high when the barometer is at 31 in., given that 1 cubic ft. of air at a pressure of 30 in. weighs 1·2 oz., the temperature being the same in both cases ?

Since density varies inversely as volume (thus if 1 cubic ft. of gas be compressed so as to occupy only ½ cubic ft., its density will be doubled) and volume inversely as pressure.

∴ density varies directly as pressure.

∴ 1 cubic ft. of air at pressure 31 weighs $\frac{31 \times 1{\cdot}2}{30}$ oz.

∴ the room full weighs $\frac{31 \times 1{\cdot}2 \times 18 \times 10 \times 12}{30}$, or 2678·4 oz.

3. D, E, F are the middle points of the sides BC, CA, AB respectively of a triangle ABC. Prove that forces represented by DA, EB, and FC are in equilibrium. Take moments about A.

Their algebraic sum = 2 △ AFC − 2 △ AEB

= 0, since each of these triangles is half of triangle ABC.

Similarly moments about B and C are also zero.

∴ the forces are in equilibrium.

SOLUTIONS TO MISCELLANEOUS QUESTIONS.

2. The locus is the circle circumscribing the square ; for if P be any point on this circle, and PS, PQ, PT, PR be perpendicular to the sides AB, BC, CD, DA respectively (produced where necessary) of the square ABCD, we have

$$PQ^2 + PS^2 = PQ^2 + QB^2 = PB^2,$$
$$PR^2 + PT^2 = PR^2 + RD^2 = P^2D,$$
$$\therefore\ PQ^2 + PS^2 + PR^2 + PT^2 = PB^2 + PD^2,$$
$$= BD^2, \text{ since } \angle \text{ BPD, being in a semi-circle, is a rt. } \angle$$
$$= 2 \text{ area of square.}$$

3. Position of the hour hand is $27\frac{9}{13}$ minutes past the XII.

$= 2\frac{9}{13}$ minute spaces past the V.

Now the hour hand goes 5 minute spaces while the minute goes 60.

∴ the hour hand goes $2\frac{9}{13}$ minute spaces while the minute hand goes $\frac{60 \times 2\frac{9}{13}}{5}$

$$= 32\tfrac{4}{13}.$$

∴ the real time is $32\frac{4}{13}$ minutes past 5, *i.e.*, $27\frac{9}{13}$ minutes to 6.

4. Multiplying up we get

$$(xy + 3)(yz + 1) = (y^2 + 3)(xz + 1),$$
$$\therefore\ xy^2z + xy + 3yz + 3 = xy^2z + y^2 + 3xz + 3;$$
$$\therefore\ y^2 + 3xz - xy - 3yz = 0.$$
$$\therefore\ (y - x)(y - 3z) = 0.$$
$$\therefore\ y = x \text{ or } 3z.$$

5. Is similar to one worked out in our last course.

6. A cylinder of mass, say, 50 grammes is floated in water with its axis vertical and 4 cm. of its length immersed, showing that the water pressure on its base is 50 grammes. Additional weights are put on its upper end until its base is 8 cm. immersed. We should expect the additional weights required to be 50 grammes, in which case the experiment would show that the pressure on the base was now 100 grammes, or double what it was previously.

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Head Master of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of 'Scholarship School Management.'

PUPIL TEACHERS' COURSE.

AUTUMN EXAMINATION, 1898.

EIGHTH MONTH.

WORK TO BE PREPARED.

A.—*English.*

(Students are invited to write for assistance in case of difficulty not taken in the course).

First Year.

Prepare lines 248–273 ('Lay of the Last Minstrel') with all meanings, allusions, &c.

Second Year.

1. Tabulate prefixes in the next 100 lines of 'The Task.'
2. Prepare lines 717–750. The 'Task.'

Third Year.

1. Learn 20 roots and meanings per week.
2. Prepare lines 630–742 'Comus.' Pay special attention to the paraphrase.

Notes. *'Lay of the Last Minstrel.'*

Line 250. *For.* Illative Conjunction.
254. *It.* Impersonal Pronoun.
255. This line is a Noun sentence it apposition with *it*—a common construction.
259. *Unlike.* Adj., qual., 'voices,' and gov. 'voice' in the Obj. Case.
260. *As it.* Comp. Conj.
262. *Here.* Conj., Subord., Adverbial, joining preceding and succeeding sentences.
264. *Thee.* Reflexive Pro., Obj. Case gov. by 'Hie' (usually Intransitive).
266. *Man forgive.* Imperative Mood.
267. *We have done.* Adj. sentence to *deed.*
268. *Him.* Reflexive Pro., Obj. Case gov. by 'returned.'
269. Note difference between 'Many a prayer,' and 'Many prayers.' The first suggests the repetition of the action. Supply '*he*' as subject of 'sped.'

General Paraphrase of 'The Task' (cont.).

Line 718. Another favourite writer was Cowley, probably because his works were permeated with the same ardent love for the country, the praises of which he never tired of singing. His writing reveals him as a kindred spirit whose personal acquaintance I should have prized, and though a riper knowledge has led me to recognise the demerits of his work, I am bound to bear witness to the intellectual ingenuity displayed, and to regret that his fine genius should have been caught and cramped by the intricate subtleties of learned circles. I still possess a feeling of reverence for the old courtier who passed his latter days in retirement at Chertsey, and who found a compensation for his loss of society in a more ardent worship of the muse.

Line 730. Love of nature and admiration of her beauties, is born with man, and is an instinctive feeling which he cannot suppress if he would. Although men are always differentiated by personal idiosyncrasies, yet this appreciation of the beauty of natural form and colour is common to all. In some instances education and natural predilection have resulted in a stronger development and a nicer discrimination, but in no case is it entirely absent.

Line 743. The cures and worries of business, the self-enjoyment of the voluptuary, the dim and turmoil of life in a crowded city, usually fatal to all the finer feelings of man, are unable to weaken or to finally extinguish this instinctive craving for the woods and fields. The villas and cottages by which a large town is fringed are a sufficient proof of the yearning of even the business man for the clear air and beautiful freshness of the country.

'Comus' (selected passages).

Line 679. For what purpose do you persist in punishing yourself and those delicate limbs which were never intended by nature for anything but ease and enjoyment? You are acting illogically and unfairly with what was bestowed on you for a specific purpose. You are violating the condition of the loan in neglecting the means by which your beauty may be preserved, and in refusing what is an absolute necessity to all—rest after labour, food and drink after hunger and thirst, and repose after weariness. Only drink this and you will be wonderfully refreshed.

Line 706. The philosophy enunciated by the Stoics and Cynics in advocating abstention from pleasure, is an insult to the bounteous mother—Nature. Their tenets are false, for why is nature so lavish with her gifts, filling the sea with all kinds of fish, covering the land with a thousand varieties of fruits and flowers, and providing countless herds of animals, unless it be to provide an ample and varied supply of food for man? To cover him with soft robes, myriads of worms are made to spin silk; to adorn him the earth is enriched with precious gems, and to serve his use boundless stores of metal are placed within his reach. What would be the result if mankind, in a transitory fit of temperance, determined to live on water and such simple foods as beans and lentils, to wear nothing but the commonest woollen clothing? Instead of showing gratitude to the Allgiver, it would be insulting him by despising his gifts and by apparently doubting his beneficence and care for us. Besides, nature would soon be overwhelmed and destroyed by her own increase, for the animals would multiply till they covered the earth and dispossessed mankind, the air would be darkened with countless birds, the sea would be unduly filled and crowded with the finny tribe, and the very gems ungathered would so illuminate the surface of the earth that those beneath would become so accustomed to their brilliancy as to entirely lose their own lustre.

B.—*Arithmetic.*

Continue working of general problems and any test questions available.

C.—*Music.*

Work any back questions. Plenty will be found in Stanton's 'Pupil Teacher's Notes.'

D.—*Geography.*

British N. America.—Industries, People, Towns, Government, Education, etc. Prepare thoroughly, use maps continually, and read anything connected with the subject outside the ordinary text-book. The Agent-General for Canada, the C. P. Railway Co., etc., will provide a heap of readable matter for the asking.

Note.—What is meant by the term Dominion of Canada?

The Dominion of Canada includes the whole of British North America, with the exception of Newfoundland and the coast of Labrador under its administration. It is a Federation, and includes the seven provinces:—Quebec, Ontario, Manitoba, British Columbia, Prince Edward I., New Brunswick, Nova Scotia; four provincial districts:—Alberta, Assiniboia, Saskatchewan, Athabasca; three territories:—Keewatin, North-West Territory, and North-East Territory.

In 1763 Canada was ceded to England by the Treaty of Paris, Nova Scotia was ceded in 1713, and New Brunswick and Prince Edward I. subsequently formed out of it. British Columbia was formed into a Crown Colony in 1858. These were administered as separate Crown Colonies till 1867, when, by the 'British North America Act,' the provinces of Canada (Ontario and Quebec), Nova Scotia and New Brunswick were united as 'Dominion of Canada,' with power to admit other provinces. In 1870 Manitoba was formed and admitted, with the remaining part of the Hudson Bay Territory, British Columbia followed in 1871, and Prince Edward I. in 1873. Newfoundland remains separate.

In 1882 the four Provincial districts were formed, and three of them send representatives to the Dominion Parliament. Athabasca does not.

The Central Government consist of—

(*a*) The Executive:—Governor-General (Earl of Aberdeen) and Privy Council.

(*b*) Parliament:—

(1) A Senate of 81, appointed for life by the Crown.
(2) A House of Commons of 215 members, elected every five years.

E.—*History.*

Henry II., and Richard I.

Chief points:—

Henry's possessions (prepare a map).
The contest with Beckett and the Church. Constitutions of Clarendon and murder of Beckett.
Conquest of Ireland.
Rebellions of Henry's sons.
Appointment of Itinerary Justices.
Institution of scutage.
The Crusades, and Richard's part in the Third.
The government in his absence.

F.—*Euclid.*

Second Year.—Props. 25 and 26, with four deductions per week.
Third Year.—Revise Book I., Props. 20–30, with four deductions per week.

G.—*Algebra.*

Equations—continued practice.

H.—*Teaching.*

Second Year.—Chap. VI. 'Scholarship School Management.'
Third Year.—Revise Chap. I.–III. 'Scholarship School Management.'

QUESTIONS TO BE ANSWERED.

1. *Penmanship.*
   Largehand:—Trypograph, Undulatory, Verisimilitude.
   Smallhand:—Sir William of Deloraine, good at need.

2. Write an easy essay each week:—
   (*a*) The manufacture and uses of iron.
   (*b*) Autumn.
   (*c*) A Norman Castle.
   (*d*) Character.

3. *English.*
   First Year.—(1) Analyse Stanza 20 and parse: Rode (223), neither known (227), bewildered the sight to see, so brotherly.
   (2) Analyse Stanza 21 and parse: What thou hast to do, we may dearly rue as he took it.

(3) Give some examples of nouns which you know to be feminine by the form of the final syllable.

(4) Give the meaning of the suffix in Womanhood, Darkness, Position, Lovely, Despotism, Movement, Claimant.

Second Year.—(1) Paraphrase lines 659–670; 671–690; 691–699; 709–717.

(2) Analyse the same passages and parse: like (659), like flowers selected (667), to fill (668), to be endured (670), perhaps (672), once combined (673), seem at once (678), are yet (698), to speak its excellence (712), as twice seven years (714), because not sooner found.

Third Year.—(1) Paraphrase lines 549–569; 585–598; 618–630; 641–653.

(2) Analyse the same lines.

(3) Parse—

'That even silence was took ere she was ware.'
'And wished she never more might be, still to be so displaced.'
'Thy sword can do thee little stead.'
'He culled me out.'

(4) Give, with examples, all the suffixes you can expressing similarity.

(5) What do you understand by Dominion of Canada? Enumerate the States and their Capitals.

(6) Describe a journey by the Canadian Pacific Railway.

(7) Compare and contrast Nova Scotia and Manitoba.

(8) Describe the River and Lake System of Canada, and show of what value it is.

(9) What do you know of Quebec, Montreal, St. John, St. Johns, Yarmouth, Toronto, Hamilton, Port Arthur, Winnipeg, Regina, Calgarry, Banff, Vancouver, New Westminster?

(10) What was the Investiture Dispute? How did it arise and how was it settled?

(11) Give the chief terms of Henry's Great Charter.

(12) Give some account of England during the Civil War. What are Adulterine Castles?

(13) Write notes for lesson on the Sea *or* a Farmyard,

or

How would you prove to children the rule for cancelling, or for subtraction by the method of equal addition.

SPRING EXAMINATION, 1899.

SECOND MONTH—MAY.

There are few changes in the syllabus for 1899, notwithstanding the Report of the late Commission held of the Pupil Teacher System. This is dealt with exhaustively in last month's issue.

For Reading the same books are prescribed, viz.:—

'Ivanhoe' for First Year, 'Vicar of Wakefield' for Second Year (Macmillan's edition is the best), Macaulay's 'Essay on Clive' and 'on John Bunyan,' OR 'Boswell's Life of Johnson,' for the Third Year. There are several annotated editions of the essays.

The English poems for study are—

First Year.—Gray's 'Bard' and 'Ode on Spring.'

Second Year.—Goldsmith's 'Deserted Village.'

Third Year.—Pope's 'Essay on Man.' Ep. IV.

The following are some useful editions :—

Gray's 'Bard' and 'Ode on Spring.'
Macmillan's (6d.), 'Bard' only. 'Ode on Spring' in preparation.
Blackie's (2d.), 'The Bard.'
Chambers' (4d.), 'Odes and Elegies,' containing both poems, with notes.
Longman's (1s.), 'Gray's Poems" (complete).

Goldsmith's 'Deserted Village.'
Blackie's (2d.).
Macmillan's (1s.)
Chamber's (2d.).
Longman's (1s.)

Pope's 'Essay on Man.'
Chambers' (4d.).
Macmillan's (1s. 3d. cloth, or 1s. paper).
Clarendon Press (1s. 6d.), by Mark Pattison.

Of these we should recommend Macmillan's or Longman's, with Chambers' or Blackie's for interleaving and general notes.

WORK TO BE PREPARED.

A.—*English.*

First Year.

Prepare lines 1–28 of 'The Bard.'

Second Year.

1. Prepare ½ of the Latin Prefixes.
2. Prepare lines 1–50 'The Deserted Village.'

Third Year.

1. Learn 20 roots and meanings per week.
2. Prepare lines 1–40 Pope's 'Essay on Man.' Ep. IV.

Pay great attention to the Paraphrases. Prepare the notes given below, and write for assistance in case any difficulty is experienced.

'The Bard.'

Introductory.

Although Gray is known to most readers by his poem 'The Elegy in a Country Churchyard,' the poem selected for First Year Pupil Teachers is no less worth careful study. Gray was not a prolific writer, but all that he wrote is marked by a careful polish, a literary ease, a felicity of expression, by fervour and dramatic power, in which respect 'The Bard' stands perhaps pre-eminent. It is called a Pindaric ode, because written in the style and measure of Pindar, the great Greek writer of odes. The variety of metre adds to the charm, and can be used by such a writer as Gray to produce the finest effects, as will be observed in following the text.

The Ode is founded on a tradition that Edward I., who reduced Wales to English sway, ordered all the bards to be put to death. Historically this is quite inaccurate, but as all popular impressions have some fact on which they are based, so in this case the feeling may have arisen from the far-off days when Suetonius Paulinus invaded Wales and many of the bards were put to death in Anglesea. The transference of the deed from the Roman general to the king who finally destroyed the independence of Wales was easy.

The greater part of the Ode is supposed to be spoken by one of the old bards, who had escaped the slaughter of his companions, and who confronts Edward on his victorious march. After a lament for his brothers, he proceeds with prophetic vision to curse Edward and his race, to foretell the misfortunes of Edward II., the miserable end of Edward III., the death of Richard II., the wars of the Roses, with their attendant cruelties. Changing his key, he then details with rapture the accession of a line of sovereigns descended from the Welsh (viz., the Tudor line), the glories of Elizabeth's court, and the rise of the 'sweet choir of song' which distinguished her reign. Having fulfilled his mission, he jumps into the river and is drowned.

Notes.

Line 1. The verb in each of these lines is Imperative Mood.
3. A participial enlargement of They in line 4.
'Crimson wing,' an allusion to the supposed bloodshed which had occurred.
5. Helm, mail, virtues = Nominatives to 'shall avail.'
even. Adj. of emphasis limiting 'virtues.' Note this use of '*even*.'
Tyrant. Nominative of Address.
6. *To save*. Extension of the Predicate 'shall avail.'
9. *Such*. Adj. Demons. qual. 'sounds' predicatively.
11 & 12. Adverbial sentence of time.
13. *aghast* = Adverb of Manner mod. 'stood.'
14. '*To arms*' form the direct object of 'cried.' It is a contracted noun sentence.
quivering. That is, shaking with anger at such an insolent interruption. Gilbert Clare, Red Earl of Gloucester, and Mortimer of Wigmore, were both Lords Marchers, whose duty it was to defend the southern frontier of England against Wales. They would be sure to accompany the king on such an expedition.
17. Not a sentence. Participial enlargement of Port.
19. Read. His beard was loose.
20. *like*. Adverbial Conjunction, usually, as in this case, joining an elliptical sentence to the preceding—*i.e.*, His hair streamed like a meteor streams.
21. *Fire*. Objective case gov. by *with*.
23. *How*. Adverbial Conjunction. Often used to join a noun sentence to the principal.
Each. Distributive Adjective limiting 'oak.'
24. *Sighs*. The nominatives are *oak* and *cave*. The verb is in the Singular, because the nouns in Nom. Case are taken separately beneath Adj. qual. 'voice.'
26. Supply *thee* for subject.
27. Supply *they are* at the beginning of line. No = Adv. of Negat. lim. *move*, Move = Adv. of Time mod. *are vocal*.

The meaning of the last six lines is :—The caverns and trees on the mountain side no longer resound with the melody of Hoel's harp or the sweet song of the noble Llewellyn, but murmur and sigh curses on the king who had destroyed them, while the river below answers them in deeper and hoarser tones.

Derivations, etc.

Ruthless. Ruth = pity, and less = without.
Helm. A.S. helm to cover. A covering for the head, usually a piece of defensive armour.
nightly. ly suffix meaning 'pertaining to.' Forms Adj. from noun.
Cambria. The old name of Wales, meaning 'the land of the Cymri' (pronounced Coomree), which the Welsh call themselves. Welsh from A.S. Wealas = strangers.
toilsome. Suffix = some, meaning 'partaking of the nature of.' Cf. venturesome, winsome.
aghast. A.S. *a* intensitive, gæstan = to terrify.
haughty. Latin *Altus*, French *haut*, meaning originally *high*. Now used with restricted meaning.
haggard. hag = a witch, ard = art.
Line 20. Cf. Milton, 'Shone like a meteor streaming to the wind.'
,, 28. Note the alliteration in this line. 'Llewellyn's lay,' *i.e.*, the lay or poem celebrating that prince—*not* written by him.

Goldsmith's 'Deserted Village.' General Paraphrase.

Of all the charming villages scattered over the central plain of Ireland there was none more delightful than the village of Auburn. The population consisted almost entirely of the labouring class, who enjoyed the double blessing of health and competence. Spring seemed to visit it earlier than other places, and the beauties of summer lingered far into the autumn as if loath to leave so beautiful a spot. My imagination often carries me there, where I spent many of the happiest days of my youth, an age at which the mind is more easily pleased and delighted with the happiness of rural life. How vividly does the scene present itself even now to my imagination! The scattered houses nestling in sheltered spots, the farmhouse surrounded by its well-tilled fields, the bubbling brook winding its way through the village, the never weary mill, the neat little church on the hill overlooking the valley, the winding road sheltered with hawthorns, by the side of which were the seats occupied by talkative old people, or the quieter lovers.

The happiness of the people could best perhaps be seen in the evenings. On a summer evening, when the labours of the day was done, the whole village met on the shady green to pass a short time in mirthful recreation. While the older people sat and criticised, the younger people indulged in innocent games and trials of skill and endurance, changing from one to the other as soon as either became monotonous. Or a merry dance was indulged in, often ending with a test of endurance as to which couple could continue longest. The laughter provoked by the accidentally smutted face, the young girls' innocent glances of artless love—held in check perhaps by the look of the mother, which suggested a greater reserve and maidenly dignity—all formed a scene of peaceful happiness which shed its brightness in every house and helped to brighten the arduous labours of the day.

But, alas! this state of pastoral happiness has vanished owing to the different system of land tenure now obtaining. The land, once divided among peasant proprietors, has now passed into the hands of one rich man, with the result that half of it is left uncultivated. The once sparkling brook now forces its sluggish way through reeds and sedges, the only inhabitant of the wood is the booming bittern, and in place of the sound of merry laughter, the melancholy and monotonous cry of the lapwing breaks the stillness of the air. The houses are crumbled to heaps of rubbish, and in some cases their ruins are nearly hidden by the rank growth of grass, while the formerly happy and contented peasantry have been forced against their will to seek a new home in some land far away from their native place.

Notes on Parsing and Analysis.

Line 1. An apostrophe, not a sentence, and therefore not to be analysed. Auburn = nom. of Address.
2, 3, 4. Adjectival sentence to Auburn.
5. Nom. of address.
6. every = Distributive Adjective limiting 'short.'
7. How = Interrog. Adj. mod. 'often.'
8. Adjectival sentence to 'green.'
10, etc. *cot, farm, brook, mill, church, bush* = Enlargements in Apposition with *charm*.
14. made = Participle qual. *seats*, of which the whole line is a Participle Enlargement.
16. Adjectival sentence to '*day*.'
'remitting.' Imperfect Participle qualifying 'toil.'
17 & 18. Sentence co-ordinate with line 16.
19. Adverbial sentence to 'led.'
20. 'Young contending.' Nom. Absolute Construction.
'as the old surveyed.' Adverb sentence to 'contending.' Old = Collective Noun.
21. 'many a gambol' means the same action repeated on separate occasions, while many gambols might mean actions recurring at the same time.
23. 'As each,' etc. Adverbial to 'inspired.'
25. 'pair,' 'swain,' 'looks,' 'glance,' may be taken in apposition with 'these,' line 30.
26. 'each other.' Parse together. Reciprocal Pronoun Sing. No. Obj. Case gov. by 'tire.'
31. 'like.' Adj. qual. 'sports' and gov. 'these' in Obj. Case.
32. 'even.' Adj. of Emphasis, relating to 'toil.' 'Toil to please' = Object of taught.
39. 'only' = Adj. Numerical limiting 'master' = Latin *solus*.
41. 'More' = Adv. of Time mod. reflects.
43. 'Guest' — in apposition with Bittern.
49. 'Trembling,' 'shrinking.' Imperfect Participles qual. 'children.'
56. Far = Adverb of Degree mod. 'away.'

Pope's 'Essay on Man.' Epistle IV.

This poem will give all Third Year Pupil Teachers plenty of work if they wish to fully understand it. It is somewhat difficult to understand the motives which prompted the selection of it at all. But since it *is* set, every effort must be made to prepare it thoroughly. Either of the editions mentioned above will do for use; but those who wish to understand Pope's position should study Mark Pattison's Introduction to the Clarendon Press edition.

A short introduction is necessary here to put the student into the proper channel of thought.

1. The period in which Pope lived was an age in which the question of man's relation to his Maker was much discussed. The whole of the ideas of the time is well summed up in Pope's line, 'The proper study of mankind is man.' It is unnecessary, though highly instructive, to go into the various theories proposed by various writers. It is easily understood that on such a subject they would vary very much, ranging from one extreme to the other.

2. Pope set out with the idea of formulating a new theory, which was to avoid extremes. It is said that most of the ideas came from his friend, Henry St. John, Lord Bolingbroke, and that Pope merely versified his statements. Doubtless St. John had a great deal to do with the philosophy of the poem.

In the 1st Epistle, Pope states his intention of 'justifying the ways of God to man,' and he prides himself on taking a common-sense view of the subject.

3. What was the result? By taking a little from one system and a little from another, Pope has succeeded in producing a system which is no system at all, which is self-contradictory, and which is in many places incoherent. He did not know enough of his subject, he felt no great interest in it, and wrote as a kind of duty to his age. Work produced under such influences is never satisfactory.

4. The 4th Epistle deals with 'the nature and state of man with regard to happiness.' The pivot on which the whole argument depends is, 'What is meant by happiness?' Varro, who died B.C. 28, reckoned 288 opinions as to happiness which existed up to *his* time. Pope's idea is expressed in lines 37 and 38, 'What happiness we justly call subsists not in the good of one, but all,' a view held by Cumberland, and, with trifling difference, by Kant. This means that no act of man will bring him happiness unless it tends to increase the happiness of the human species as a whole. This is a very debateable position.

General Paraphrase.

Lines 1–19.—Happiness, by whatever name we call it—good, pleasure, comfort, contentment—seems to be the main object of our very existence. It is something for which we continually crave, for which we bear the numerous hardships of life, and for which many have been willing to suffer martyrdom. It seems always to be nearly within our grasp, we hasten forward to obtain it, yet so elusive is it that we never attain to it. Where shall we seek it, in what place does it flourish best? Is it to be found in the gaiety and glitter of the court, in the accumulation of wealth from the mine, in the fame and repute gained in the world of letters, or in the glory and glitter of the military life? It is to be found everywhere, in every place and every grade of society, and if anyone is unable to find it, the fault is in themselves and not in their position. It is ever free, not to be bought, and deserts the monarch to dwell with the private citizen.

Lines 19–30. It is useless to inquire of the learned how to attain it. They are themselves blind, and give most opposite opinions. Some say that it lies in philanthropy, in doing good to fellow men, others in withdrawing altogether from human affairs and living the life of the hermit. Some, as the Epicureans, profess to find it in action, others, as the Stoics, in ease and indifference. The Epicureans, indulging every whim like a beast, find their pleasure end in pain; while the Stoics, endeavouring to elevate themselves to the position of a god, confess at last that they have been following a myth. Others, again, are careless as to which opinion they lean, and either believe everything, or, like the sceptics, profess to believe nothing.

Those who follow these beliefs simply say that 'happiness *is* happiness,' which does not help us at all.

And yet the matter is not one of great difficulty. If we clear our minds from conventional ideas and theories, and study the general plan of nature, we shall see that every community can enjoy it, and every individual understand it. Nothing more is demanded of us than clear thinking and good intention, and we shall see that however we may grumble over our various positions, we all have equal blessings and equal chances of happiness.

The basis on which the whole question rests is this, that the Divine Creator directs the world by general laws which apply to all and not by particular laws for the individual, and that what we correctly term happiness is not the elevation of any particular individual, but the general advancement of the whole human race.

Notes on Parsing and Analysis.

The student will find it necessary throughout the poem to supply a good deal that is understood in order to analyse or parse correctly. I should strongly advise all to write the passages out in prose order, filling in the analyses before attempting to analyse.

Space will prevent me from dealing with every little difficulty, but students should write for assistance if they find anything which they cannot solve for themselves.

1. Apostrophe. Noms. of Address.
2. Whate'er thy name may be.
3. *That*. Demon. Adj. line *something*, which is Abs. Noun in apposition with nouns in preceding line.
4. To live — living. Gerund forming the object of 'bear.'
'Or for which we dare to die.'
5. 'Near.' Adj. qualifying which and gov. '*us*' in Objective Case.
6. Supply 'which is.'
7. 'it drops below.' Elliptical Adverb sentence to 'deign'st.'
8. 'To grow.' Gerund object of 'deign't.'
9, 10, 11, 12. Extensions of 'grows' in line 13. N.B.—Shine — a noun.
11. (which) Parnassian laurels yield. Adjectival sentence to wreaths.
13. If our toil (is) vain.
14. 'Ought'— Principal Verb. 'To blame the culture not the soil' — Object of ought.
18. 'Fled from monarchs.' Participial enlargement of 'it' subject of dwells.
22. Note double object after 'call.'
23. 'Sunk to beasts.' Participial enlargement of 'some.'
24. 'swelled to gods.'
'even,' Adjective of emphasis to 'virtue.' 'Vain' — Adj. qual. 'virtue.'
28. 'Than' — Comparative Conjunction 'this' Obj. Case governed by 'say.'
31. 'Her goods *are* obvious.'
32. 'Thinking' and 'meaning.' Grounds subj. of meeds.
'but' — Adv. mod. 'thinking.'
'right' — Adverb. modifying 'thinking.'
33. 'And though we may mourn,' etc.
37. Object of 'makes' — remainder of line and next line. (To) subsist — Infinitive.

B.—*Arithmetic.*

First Year.

Boys.—Complex and Continued Fractions.

Girls.—Simple Practice.

Second Year.

Boys.—Compound Proportions.

Girls.—Compound and Complex Fractions.

Third Year.

Boys.—Cube root. As in Square Root. Compare method with Algebraic.

Girls.—Recurring Decimals. Pay great attention to the Theory.

C.—*Music.*

First Year.—Standard scale of pitch and mental effects.

Second Year.—Continue practice at Transition.

Third Year.—Names of Chromatic Notes and Chromatic Intervals.

D.—*Geography.*

Europe.—Climate, Productions, Peoples, Religions, etc.

France—completely. Use note-books and sketch maps continually.

E.—*History.*

Henry IV., Henry V., and Henry VI. up to Wars of Roses.

Chief points :—

Henry's right to the throne, and how it affected his relations with Parliament.
The various insurrections against him.
The persecution of the Lollards.
Henry V. War with France. Cause, Course, Results.
Henry VII. Minority. Loss of French possessions. Joan of Arc.

F.—*Euclid.*

Second Year.—Props. 1–4, Book I.

Third Year.—Props. 32–36, Book I., and 4 deductions per week.

G.—*Algebra.*

Multiplication and Division.

H.—*Teaching.*

Prepare notes of lessons weekly.

Second Year.—Chapter II., Scholarship School Management.

Third Year.—The Teaching of Geography.

Test Questions.

1. *Penmanship.*

Largehand :—Dynastical, Efflorescence, Faithfulness.

Smallhand :—What happiness we call
Consists not in the good of one but all.

2. *Composition.*—Write an essay each week on such subjects as—

The British Empire, Temperance, The Choice of Books, War, Sleep, What is Education?

3. *English.*

First Year.—Give the meaning of the suffixes in the following :—Braggart, kingdom, godhead, kindred, webster, steward, landscape, manifold, tearless, homeward, nowise, cleanse. height, twinkle.

Second Year.—Give the meaning of prefixes in the following :—Ambiguous, bifurcate, collide, countermine, distill, inquire, equiangular, interpellate, mischief, pellucid, triangle, viceroy.

Third Year.—Give some rules by which you would distinguish words of Teutonic origin from those of classical origin.

4. *First Year.*—Name the following intervals :—

{t / n} {r' / s} {d / t,} {d / m} {s / l,} {t / f} {l / r}

Second Year.—Rewrite the following on the Imperfect Method :—

d n r l sd t, r f n d s n r f n l, t, ds n d

Third Year.—Write and explain the three forms of the Minor Scale.

5. Give an account of the mountain system of Europe.

6. Enumerate the chief feature of the coast passed in a voyage from Hamburg to Constantinople.

7. Where and what are the following :—Neckar, Sulitelma, Stromboli, Yenikale, Lombardy, Iviça, Corfu, St. Gothard, Ladoga?

8. Describe, with a plan, the Battle of Bannockburn.

9. Give some account of the Judicial Reforms in the time of Edward III.

10. Explain clearly what causes brought about the Peasants' Revolt. What were the chief results?

11. Explain Edward's claim to the French throne. Give your ideas as to its justice.

12. What do you understand by the term 'School Management'?

13. How can the memory be developed?

14 (*Third Year*).—Of what value is English as a means of mental training? Sketch the plan of a first lesson in Analysis.

SCHOLARSHIP COURSE FOR DECEMBER, 1898.

1. *Reading.*—Ten minutes' oral practice per diem, and as much general reading as possible.

2. *Repetition.*—Twenty lines per week till known.

3. *Penmanship.*—Ten minutes' daily practice from a good model.

4. *Composition.*—Write one or two essays per week, selecting from the following list :—

(*a*) The British Constitution.
(*b*) Description of an English cathedral.
(*c*) Criticism of some book you have read.
(*d*) Arctic Exploration.
(*e*) 'Sweet are the uses of adversity.'
(*f*) Modes of warfare, ancient and modern.
(*g*) The influence of climate on character.
(*h*) Holidays.

Pay great attention to this subject. Send up an essay each month for criticism.

5. *English.*

(1) The Verb. Note particularly Participles and Gerunds. Auxiliary Verb. The Defective Verbs and their history. The syntax of the Verb.

(2) Learn 20 roots per week from a good list.

(3) Literature from 1603 to the Restoration. Chief writers—Chapman, Usher, Crashaw, Cowley, Herrick, Jeremy Taylor, Milton, Harrington, Baxter, Fuller, Fox.

Special study should be given to Milton, especially to his prose writings.

6. *Arithmetic.*—Percentages and Averages.

7. *Algebra.*—Simple Equations and problems thereon.

8. *Euclid.*—Book II. Finish this and work 4 deductions per week.

9. *Geography.*—Prepare—

(*a*) New Zealand.
(*b*) Holland and Belgium, Denmark and Scandinavia.
(*c*) Memory map of Ireland.

10. *History.* Henry IV. to Richard III.

Chief points :—

Henry IV.—

The first of the Lancastrian Kings. Prepare a genealogical table showing his claim.

French aid to Scots (defeated at Homildon Hill) and to Welsh.

Revolts against the King :—
1. Earls of Huntingdon, Kent, and Salisbury.
2. Wales under Owen Glyndwr; joined by the Percies; Battle of Shrewsbury.
3. Percy, Northumberland, and Scrope; execution of the third, 1407.
4. Earl of Northumberland; defeat and death at Bramham Moor, 1408.

Statutes.—De Heretico Comburendo directed against the Lollards, an account of whom must be prepared.

Henry V.—

The Lollards. Continued persecution, execution of Oldcastle in 1417.

The Renewal of French War.

Henry revived Edward's absurd claim. The nobles were tired of peace, the merchants wanted new markets, and the rate of pay of common men-at-arms was three times that of a labourer, so the war was very popular.

Henry landed and besieged Harfleur, but after his army was thinned by sickness he endeavoured to make for Calais, crossed the Somme, beat the French at Agincourt (which must be carefully read up). In 1420 Henry again crossed the Channel, and after ravaging Normandy the Treaty of Troyes was signed, which provided that Henry should marry Catherine and become king on the death of Charles.

His early death from dysentery prevented this. His widow married Owen Tudor, from whom was descended Henry VII.

Henry VI.—

Minority.

Bedford, Protector of the Realm and Regent of France.
Gloucester, Regent in England in Bedford's absence.

War in France.

The Dauphin never agreed to the Treaty of Troyes, and as Charles died shortly after Henry V., he at once became King of what part of France he could, and commenced hostilities. The English were assistsd largely by the Duke of Burgundy.

1423.—Battle of Crev ut. }
1424.—Battle of Verneuil. } In all of which the English were successful.
1428.—Battle of Herrings. }

Siege of Orleans, raised by Joan of Arc, from which time the English power rapidly declined. After conducting Charles to Rheims she was, in 1431, taken and burnt by the English.

A quarrel with the Duke of Burgundy and the death of Bedford further weakened the English cause, and notwithstanding the heroic attempts of Talbot in 1453 nothing remained but Calais.

Jack Cade's Rebellion.—Social and political discontent.

Home Affairs.

This was a period of aristocratic factions and generally weak rule. Gloucester, the popular leader, was opposed to Beaufort, Bishop of Winchester, the head of the Court party.

1422.—Henry came of age, and ruled with the advice of Beaufort, whose influence superseded Gloucester's. The latter died in 1447, and shortly after Beaufort followed him. Suffolk, who had risen into importance after the King's marriage with Margaret of Anjou, was held responsible for the loss of the French provinces, was banished and murdered at sea. The rival leaders then were Richard, Duke of York, and Somerset. In 1453 Henry went mad, and York was appointed Protector, and Somerset was imprisoned. The next year the King recovered, York was dismissed and Somerset released. The Duke of York then raised an army and marched on London, and the Wars of the Roses commenced.

Wars of the Roses.

Causes :—

1. The jealousy of the great barons, and the indecent scramble for power.
2. The weak rule of Henry VI.
3. The antipathy to Margaret of Anjou.
4. The existence of a powerful leader—Richard, Duke of York, who thought he had a better right to the throne than the King himself.

The Yorkshire claim :—

A genealogical table, showing the descent of the Yorkist and Lancastrian families, must be prepared and carefully learnt.

Briefly, Richard, Duke of York, was, through his father, descended from Edmund, fifth son of Edward II.; through his mother, from Lionel, Duke of Clarence, third son of Edward III.; while Henry VI. was descended from John of Gaunt, fourth son of Edward III. The Duke of York was thus, on one side, of an older branch than the King. He was also allied, by marriage, with the Nevilles, who were most powerful.

Battles :—

1455. St. Alban's. Yorkists victorious.
1459. Blorcheath, " "
1460. Northampton. " "
1460. Wakefield. Lancastrians victorious. Duke of York killed.
1461. Mortimer's Cross. Yorkists victorious.
1461. St. Alban's. Lancastrians victorious.
1461. Towton. Yorkists victorious.
1464. Hedgeley Moor and Hexham. Yorkists victorious.
1471. Barnet. Yorkists victorious.
1471. Tewkesbury. Yorkists victorious.

Note the following :—

The Wars of the Roses, their character and results :—

It is a common mistake to suppose that the whole of the nation was involved in these sanguinary contests; but this is not so. The war was carried on by the great barons and their armed retainers, and the general commons of the country pursued their usual avocations with less interruption, perhaps, than would have been received in time of peace. The results briefly were :—

(*a*) The final Extinction of the Feudal System. The loss of life among the barons and their retainers was enormous, and practically exterminated the powerful houses, which had kept up semi-regal state. One feature of the struggle, which is most terrible, is the ferocity with which both parties took revenge for the deaths of kinsfolk. This introduction of personal feud into a political contest accounts for the fierce contests and great loss of life. Those barons who still remained were so impoverished that they were glad to sell their estates and settle down as country gentry. Some even had to fly the country, and gained precarious livings by any menial work.

(*b*) The growth of commercial prosperity and enterprise. The great towns did well out of the contest, by obtaining concessions from both parties.

(*c*) The rise of a new nobility. Henry VII., on his accession, was able to rule quite absolutely. There were no great barons to hold him in check, and he took care that they did not regain their lost power. The new men were personal friends, who dared not oppose him.

This period is the closing scene of the 'Middle Ages,' or 'Dark Ages,' when brute strength was the only law of right. Henceforth a new era. Modern history starts, when intellect and mental ability were placed before rude strength and savagery.

Edward V. and Richard III., 1483-1485.

Richard's means of obtaining and securing the throne: Buckingham's rebellion; abolishment of Benevolences; Earl of Richmond's invasion and Battle of Bosworth. Note that Richard III. was a most able ruler and soldier, and probably, had the throne come to him in a quiet and legitimate way, would have made a great king. He certainly was not the fiend portrayed by Shakespeare.

Learn the following note :—

Advances of the Constitution under the Lancastrians and Yorkists.—As the house of Lancaster reigned solely by the choice of the people and sanction of Parliament, they seldom, if ever, ventured openly to resist the powers of the Commons, who took advantage of the circumstances to make many advances, the chief of which were :—

1. They maintained and completely established their exclusive right of taxation.
2. They controlled public expenditure, voted their supplies for special purposes, and saw that they were properly spent.
3. They made supplies depend upon redress of grievances.
4. They controlled the king's household expenditure.
5. They established more fully the fact that laws can only be made by the consent of King, Lords, and Commons.
6. They began to give advice on matters of foreign policy.
7. They maintained the right to impeach bad ministers, to freedom of speech, and freedom from arrest.

11. *Teaching.*—Chap. IV. 'Scholarship School Management.' The Teaching of Reading.

12. *Needlework.*—See notes in another column.

13. *Domestic Economy.*—Clothing. Uses. Articles employed as. Relative value of different substances. Un-Hygienic Habits in Dress. Care and Economy in Dress. Cost of Outfits, etc.

14. *Music.*—Chap. IV. 'School Music Teacher.'

15. *French.*—Chap. IV. 'Philosophe sous les Toits.' Use the *Practical Teacher* juxtalinear translation, with Notes, Hints, &c., specially prepared for Scholarship Students (2s.).

Test Questions.

1. *Penmanship.*

(*a*) Largehand—Querulous, Ornithorhyncus, Renaissance.

(*b*) Smallhand—The proper study of mankind is man.

2. Write notes of a lesson on Cocoa, The Metric System, Quicksilver, Coal mining, Fruits, and Spring Flowers.

3. *English.*—(*a*) Analyse the following passages, and parse words in italics :—

(1) *Such* is the patriot's boast *where'er* we roam,
His first, best country, *ever* is at home;
Add *yet, perhaps* if countries we compare,
And estimate the blessings which they share;
Though patriots *flatter, still* shall wisdom find
An equal portion *dealt* to all mankind,
As different *good*, by art or nature *given*
To different nations *makes* their blessings *even*.

(2) Deep midnight now involves the lurid skies,
When Eastern breezes, *yet enervate*, rise,
The waning moon behind a watery shroud,
Pale glimmering o'er the long protracted cloud;
A mighty *halo* round her silver throne,
With *parting* meteors *crossed, portentous* shone:
This in the troubled sky *full oft* prevails,
Oft *deemed* a *signal* of tempestuous gales.

(3) *The more* truly educated a man is, *the* more he is always ready and willing *to learn*. This is because, if he has won for himself the advantages of real learning, he comes then *to realise how very little*, after all, it is ever possible for man *to know*. There is no surer sign of an uneducated man, *however well* informed he may *be, than* the presence in him of the spirit that makes him think he has *no more* to learn.

(4) No reader of Tennyson can have failed *to remark* his *sympathy* with everything human, and the peculiar *grace* with which he expresses it. We feel *as* we read that it is *not only* the poet's intellect that has been occupied in the production of the poems, but *also* his *heart*. The fiercer emotions which wrong and selfishness excite in a generous nature, are *nowhere more powerfully* expressed *than* in his verse.

4. *Arithmetic.*—Work the following test paper in decimals :—

(*a*) In what sense can $\cdot\dot{9}$ be said to be equal to 1?

(*b*) What Vulgar Fractions can be expressed by Finite Decimals, and why?

(*c*) Prove the rule for converting Recurring Decimals into Vulgar Fractions.

(*d*) Express in its simplest form $\dfrac{1\cdot\dot{5}4\dot{7}\dot{6}\times 10\cdot\dot{6}18}{2\cdot\dot{6}\dot{5}4\dot{7}}$.

Ans. $6\cdot\dot{1}9$.

(*e*) Divide $\dfrac{\cdot052}{1\cdot3}$ of $1\cdot56$ by $\dfrac{\cdot0624}{14\cdot4}$ of $25\cdot92$.

Ans. $\cdot\dot{5}$

(*f*) Find the value of $(\frac{2}{3}+\frac{3}{4})$ of 4 guineas + $(\cdot09-\cdot01)$ of £2 1s. 3d. + $(5\cdot05\div\cdot005)$ of 5s. Ans. £257 2s. 2½d.

(*g*) A's share is $\cdot\dot{6}9$ of B's, B's is $3\cdot\dot{0}8$ of C's, C's is $1\cdot1$ of D's. C's share is £2,750. Find A's, B's, and D's.

Ans. A = £770, B = £8,470, D = £2,500.

(*h*) Five bells which commence tolling together, toll at intervals of $1\cdot2$, $1\cdot5$, $1\cdot75$, $1\cdot8$, $2\cdot1$ seconds respectively; at what intervals will they all toll together? Ans. 126 seconds.

(*i*) $\dfrac{8\cdot\dot{5}71428\times 1\cdot7}{2\frac{2}{3}\text{ of }1\cdot\dot{2}85714}\times\dfrac{\cdot21\dot{6}\text{ of }\cdot625}{\cdot48}$.

Ans. $1\cdot229745\dot{3}7\dot{6}$.

5. *Algebra.*

(1) $\dfrac{a}{b}-\dfrac{(a^2-b^2)x}{b^2}+\dfrac{a(a^2-b^2)x^2}{b^2(b+ax)}$. Ans. $\dfrac{bx+a}{ax+b}$

(2) $\dfrac{x}{2}\left(\dfrac{1}{x-y}\right)-\dfrac{1}{x+y}\Big)\times\dfrac{x^2-y^2}{x^2y+xy^2}\div\dfrac{1}{x+y}$. Ans. 1.

(3) $\left\{\dfrac{2}{x}-\dfrac{1}{a+x}+\dfrac{1}{a-x}\right\}\div\left\{\dfrac{a+x}{a-x}-\dfrac{a-x}{a+x}\right\}$

Ans. $\dfrac{a}{2x^2}$

(4) $\dfrac{1+\frac{1}{m}}{\frac{1}{m}}\times\dfrac{\frac{1}{m}}{m^2+\frac{1}{m}}\div\dfrac{\frac{1}{m}}{m-1+\frac{1}{m}}$ Ans. 1.

(5) $\dfrac{a-b-c}{(a-b)(a-c)}+\dfrac{b-c-a}{(b-c)(b-a)}+\dfrac{c-a-b}{(c-a)(c-b)}$.

Ans. 0.

(6) $\dfrac{x^2-(2y-3z)^2}{(3z+x)^2-4y^2}+\dfrac{4y^2-(3z-x)^2}{(x+2y)^2-9z^2}+\dfrac{9z^2-(x-2y)^2}{(2y+3z)^2-x^2}$

Ans. 1.

6. *Geography.*

(*a*) How are the Australian Colonies governed? What change in connection with this is being discussed?

(*b*) Give some account of the industries, imports and exports of New South Wales.

(*c*) Explain in what way the climate has been a drawback to Australian development.

(*d*) Describe the goldfields of West Australia.

7. *History.*

(*a*) Point out the chief legislative reforms under the Edwards.

(*b*) How did Edward I. come to interfere in Scotch affairs, and with what result?

(*c*) Discuss Edward III.'s claim to the French throne. Give, with dates, the chief events in the French War during his reign.

(*d*) Explain clearly the causes leading to the Peasants' Revolt. Why were lawyers particularly obnoxious to them? What were the results of the rising?

8. *Domestic Economy.*

(*a*) Discuss the relative values of tea, coffee, and cocoa as beverages.

(*b*) Give plain directions for making a loaf of bread.

(*c*) Write notes of a lesson on alcoholic drinks.

9. *Music.*

Explain the structure of a scale. How would you teach the notes to children? What do you understand by mental effects of notes? How are they modified?

CORRESPONDENCE.

RULES.

1. Individual assistance will be given as far as possible by advice, solution of difficulties in any subjects, model answers, etc.
2. Specimens of Writing, Paraphrasing, Maps, Composition, etc., will be marked and criticised gratis.
3. To assist students in rural districts, Freehand or Model Drawings will be corrected and marked, with hints for improvement, etc., and returned if accompanied by a postage stamp.
4. As a rule all replies will appear in the Correspondence Column, but anyone desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.
5. To ensure an answer in the next issue queries must be sent by the 15th of each month.
6. Name and address of sender, with coupon of current number of the PRACTICAL TEACHER, and *nom de plume* if desired, must be enclosed.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to 'A. T. FLUX, The Bays, Belvedere, Kent.'

ANSWERS TO CORRESPONDENTS.

'WOLD.'—A very good essay, 50/60. Should, however, be broken into paragraphs.

Other Correspondents answered by post.

NEXT MONTH'S CONTRIBUTIONS:

The Second Illustrated Article on

EDUCATIONAL TRAVEL IN SPAIN.

By a Practical Teacher.

An Illustrated Visit to

THE NORTHAMPTON INSTITUTE

(*The City Polytechnic*).

A SCHEME OF OBJECT LESSONS FOR COUNTRY SCHOOLS.

OUR 1898 CERTIFICATE CLASS.

BY J. C. HOROBIN, M.A.,
Principal, Cavendish College, Cambridge.

The Examination for Certificates will commence on Monday, 11th July 1898, at 2 p.m.

The general conditions for candidates are to be found in Articles 55–64 and 116–121 of the current Code.

SOME QUESTIONS ON THE THEORY OF TEACHING AND NOTES THEREON.

1. What do you understand by Virtue?

Primarily virtue (virtus—vir) meant manliness, with specific reference to courage, and therefore by implication it means strength.

Kant defines it, 'Virtue signifies a moral strength of Will.' It is a quality of character which manifests itself in right conduct, though it must be distinguished from duty. Thus it is a duty to pay one's debts, but hardly a virtue; whilst, on the other hand, there are actions which obtain praise, but the omission is not condemned.

Socrates declared that Virtue was Knowledge, and that all vice arose from ignorance.

To some degree this is true, but everyone recognises the truth of Ovid's aphorism, 'I see the better course, approve it, and follow the wrong'; and the Biblical, 'The evil which I will not, that I do.'

Plato defined virtue as the fitness by which the soul performed its work, and classified virtues as Wisdom, Courage, Temperance, with a harmony of the three called Justice.

Aristotle defines virtue as 'such a moral state as makes a man good and able to perform his proper function well,' meaning by moral state what we mean by habit.

In this view the child is father to the man, and virtue is the outcome of repeated virtuous acts. This view is nearly that of the New Testament, where temperance and moderation as regulated by reason are inculcated repeatedly.

2. Distinguish carefully Social and Individual Virtues.

Social virtues are usually very definite, being determinant as those demanded by justice, or indeterminate as those regarded under benevolence. But this distinction is more for jurisprudence, since all obligations are equally binding ethically.

In considering personal virtues it is important to note that the subject is not regarded as 'affectional' or 'sentient,' but as a moral being not bounded by 'is,' but by 'ought to be.'

There are no rules, every man being a law unto himself; but any attempt at systematisation must be based on the tripartite division of our nature into physical, intellectual, and moral.

3. What do you understand by Justice?

It is largely a negative virtue removing obstacles to well-doing, as when the function of government is said to be to 'make it easy to do right, difficult to do wrong.'

But this is not the view of the early philosophers. Plato says, 'Justice is the harmony of the soul, producing uprightness in social relations.'

Aristotle makes a subtle distinction between (*a*) Uprightness as opposed to lawlessness—viz., a society virtue; and (*b*) Fairness in the senses of distribution of honours and correction of offences. School discipline is an example of the latter, for it must secure—

(1) Equality of treatment for all in rules and regulations.
(2) Rigid observance of contracts, promises, obligations, rewards, and punishments.
(3) Advance towards an ideal standard.

4. Discuss the phrase 'Relative importance of virtues.'

No fixed tabulation is possible since times and places necessarily change relations.

For example, in a military state courage is unduly eulogised, the early Church subordinated everything to chastity, whilst chivalry was the *summum bonum* of mediæval times.

Races and sexes vary in their estimation of what is cardinal and what of lesser importance. But there is a general agreement that the following is a workable classification:—Truthfulness, Justice, Temperance, Prudence, Courage, Benevolence.

5. What do you understand by Moral Faculty and Conscience?

Shaftesbury propounded the theory of a mental sensibility to moral qualities analogous to the sensations arising from matter

qualities. In this view each mind has as a natural endowment the power of appreciating the difference between virtuous and vicious acts. That is, morality depends more on Feeling than Reason.

Conscience is the power the mind possesses of discovering universal truth. It is a sort of higher reflective principle which reviews the actions as tested by the accepted principles, and passes judgment thereon. Butler is the great exponent and defender of the supremacy of Conscience. It originates on, and has authority over, the Self, and involves two separate ideas—(1) feeling of pleasure and pain, (2) judgment.

Intuitionists consider conscience as an innate mental power; but Bain, following the Utilitarian school, considers it as a product of experience.

What is acceptable to all schools is, that every child is born with certain tendencies due to family and racial evolution, but these are developed by the exercise which is given in a properly organised educational system.

6. What do we mean by the Will?

Some philosophers regard it as a special faculty. Locke describes it as 'the power to begin or forbear, continue or end actions of our minds and motions of our bodies, by a thought or preference of the mind, ordering, or, as it were, commanding the doing or not doing.' Bain considers Will as resolvable into action and feeling. To the teacher it is not of much importance, which view is taken because it is 'acts of Will' with which the educator has to do. The proper development of Will-power and its training so as to obtain a fixed disposition towards right action is moral education. In this view we have in ascending order, as the aim of a good school, Instruction, Education, Morality.

SYLLABUS OF WORK FOR THE MONTH.

Students are advised not only to get up the work indicated, but also to use the test questions as indications of work to be got up and afterwards written out.

FIRST YEAR.

School Management.

1. Infant school discipline.
2. Drawing and Science—their place in a Primary school curriculum.
3. The principles and limits of the Kindergarten.
4. Comparison of the ordinary Standard requirements with the special courses for small schools.

Composition.

1. Lamb's style.
2. Individualism.
3. Socialism.
4. Rewards and Punishments.

Arithmetic.

Not less than six examples from miscellaneous sets ought to be worked per week, as well as some on the particular work set and the examination questions given.

1. Theory of Subtraction—Multiplication of Fractions.
2. Theory of Remainder in Division—Position of Decimal point in Multiplication.
3. Mensuration of the Circle—Square measure and its relation to papering, carpeting, and land measurements.
4. Interest—Discount—Profit and Loss.

Music.

1. Requirements and writing tests for Div. I. and III.
2. Musical terms—Metronome.
3. Requirements and tests for Div. II. and IV.
4. Mental effects—Lah mode.

English.

1. Inflection of nouns and history of them.
2. Latin and Modern elements in English.
3. Adjectives—their history and inflection.
4. Greek and modern elements in English.

Literature.

1. Lamb's Essays, 'Old Actors': Wordsworth, 'Ballad Poems.'
2. ,, ,, 'Roast Pig': ,, Lyrics (1st half).
3. ,, ,, 'Chimney Sweepers': Wordsworth, 'Dion,' 'Immortality.'
4. ,, 'Dream Children': Wordsworth, Lyrics (2nd half).

Geography.

1. Ireland (physical)—Belgium—Denmark.
2. ,, (political)—Switzerland—Greece.
3. ,, (railways—trade)—Italy—Portugal.
4. ,, (ports, canals, telegraphs, etc.)—Spain.

History.

1. Geo. I.—More—Chartists.
2. Commonwealth—Dundee—Irish Parliamentary Union.
3. Geo. II.—American War of Independence.
4. Charles II.—Petition of Right—Bill of Right.

MEN ONLY.

Algebra.

1. Theory of S. Equations and H.C.F.
2. Theory of ratio and Proportion, L.C.M.
3. Factors—Arithmetic Progression.
4. Factors—Variation.

N.B.—Exercises should be worked on these subjects as well as the bookwork got up.

Geometry.

1. I. 41–44; II. 4, 7; III. 5 and 28.
2. I. 45–48; II. 5, 9; III. 6 and 29.
3. I. Definitions; II. 6, 10; III. 7 and 30.
4. I. Axioms; II. 7, 11; III. 8 and 31.

WOMEN ONLY.

Needlework.

As last month, especially with variation of scale.

Domestic Economy.

1. Materials of clothing.
2. Care of clothing.
3. Boots—drinks (healthy and sick).
4. Nursemaid's duties.

N.B.—Students should get the revised Domestic Economy (Nelson and Sons).

OR,

Geometry.

Revise Definitions.
Props. 13–18.
Try simple Exercises on Props. 4, 5, 6, 7, 8.

SECOND YEAR.

Composition.
Music.
Arithmetic.
Geography.
Needlework.
} As First Year.

School Management.

1. Fitch V.—As First Year.
   Code requirements in St. IV.
2. Fitch VI.—As First Year.
   Code requirements in St. V.
3. Fitch VII.—As First Year.
   Code requirements in St. VI.
4. Fitch VIII.—As First Year.
   Code requirements in St. VII.

English.

Grammar and Wordsworth as in First Year.

1. Hamlet, Act V. Sc. 1., M.N.D. Sources of Play.
2. Hamlet, Act V. Sc. 2., M.N.D. Chief characters.
3. Hamlet, Act I. Sc. 1–2, M.N.D. Sketch of Plot.
4. Hamlet, Act I. Sc. 3–5, M.N.D. Typical exerpts.

N.B.—In the Wordsworth and Hamlet note any awkward grammar and allusions.

MEN ONLY.

Algebra.

As First Year each week.

1. Logarithms—S. Interest and Discount.
2. Logarithms—C. Interest and Disconnt.
3. Logarithms—Annuities.
4. Logarithms—Annuities.

Geometry.

As First Year each week.

1. Revise definitions of Book V., Prop. VI. 1–2.
2. ,, ,, ,, 3–4.
3. ,, ,, ,, 5–6.
4. ,, ,, ,, 7–8.

WOMEN ONLY.

Domestic Economy.

As First Year each week.

1. Meats—modes of cutting up and preserving.
2. Eggs—cooking—preserving.
3. Small fruits—uses—jam.
4. Building Societies—Friendly Societies.

OR,

Geometry.

As First Year.

Also Props. 24, 34, 44, 47.

QUESTIONS FOR TESTS, ETC.

FIRST YEAR.

School Management.

1. What do you know of the use and limits of the Kindergarten?
2. In what particulars does the discipline of an Infant School differ from that of the older children?

Composition.

Write a criticism on Lamb's Style.

Arithmetic.

1. Prove diagrammatically that $\frac{3}{5}$ of $\frac{5}{6} = \frac{1}{2}$.
2. Work the following by short division, and explain clearly the theory of obtaining the proper remainder from the partial remainders 286. 579 ÷ 105.
3. Find the banker's discount on a bill for £655 10s. drawn on Jan. 11 for 8 months and discounted at 4% on April 14th.
4. At what time between 6 and 7 o'clock will the hands of a watch be together?

Penmanship.

Write in small and text-hand Areopagus;
The greatest of British interests is Peace.

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1. Define the following: forte, diminuendo, andantino, maestro, accelerando, M70.
2. Write suitable Time Test for Divisions II. and IV.

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1. Give an account of the inflexions of nouns and their history.
2. Parse Dream Children—I–II, to, to, when, whom, that, than-that, which, with.
3. Analyse Dion: Stanza vi.
4. Comment upon metaphrases, sock, stole and albe, hoydens, usufruct, phoenixes, villatic, radiant jellies, Lethe—Dion—Academe—Ilissus—ethereal—Auster.

History.

1. What do you know of the causes, principal events and persons concerned in the American War of Independence?
2. Distinguish carefully, stating the provisions, The Petition of Right, and The Bill of Rights.

Geography.

1. Draw a map of Ireland, showing the principal railways, canals, and telegraph connections with Great Britain.
2. Compare Denmark and Greece.

MEN ONLY.

Algebra.

1. If a : b :: c : d then

$$\frac{a^2 - ab + b^2}{(a-b)^2} = \frac{c^2 - cd + d^2}{(c-d)^2}.$$

2. Prove that a simple equation can only have one root.

Solve (*a*) $\frac{60 - x}{14} - \frac{3x - 5}{7} = 6 - \frac{24 - 3x}{4}$,

(*b*) $(x + 1)(y + 1) = 60$,
$xy = 45$.

Geometry.

1. Prove II. 4. Show how to divide a line so that the rectangle contained by the parts is a maximum.
2. Prove III. 24. Find the locus of a point which moves in such a manner that the angle contained between two straight lines joining it to the ends of a fixed straight line is constant.

WOMEN ONLY.

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1. Work a buttonhole, sew on a button, stitch on a tape, and work six inches of each stitch used in the garment to be made up.

Domestic Economy.

1. Why do young children require more clothing than adults?
2. Give some cooling drinks suitable for a sick person, and how would you prepare one of them?

OR

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1. Define line, angle, rhombus, circle, and enunciate postulate 1, and axioms 3, 5, 7.

SECOND YEAR.

Music.
Arithmetic.
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Penmanship.
} As First Year.

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Write a criticism on Wordsworth's style.

School Management.

1. What has Fitch to say on the use and limits of the Kindergarten, and the relation of Principal and Assistant Teachers?
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1. Grammar and Wordsworth as First Year.
2. Write a sketch of the Plot, and indicate the sources from which the Play of M.N.D. is drawn.
3. In what connection are the following places mentioned in Hamlet: Elsenore, Ilium, the Capitol, Barbary, Olympus, Ossa, Pelion, Wittenberg.

History.

1. As First Year.
2. Give an account of the Chartists, and the events immediately preceding the Battle of Waterloo.

MEN ONLY.

Algebra.

1. As First Year, etc.
2. Prove—

(*a*) $\log. \frac{a^m}{b^n} = m \log. a - n \log. b.$

(*b*) $\log. \frac{1}{m} = -\log. m.$

Given log. 2 and log. 3, find log. 108 and log. ·00142.

3. In how many years will a sum of money double itself at 4 per cent. per annum C.I.

log. 26 = 1·41497.

Geometry.

1. As First Year, etc.
2. Prove IV. 10. Show how to describe an equilateral triangle in a square.
3. Prove VI. 19. Show how to bisect a triangle by a line parallel to the side.

WOMEN ONLY.

Domestic Economy.

1. As First Year, etc.
2. Explain the following terms—insurance, cash prices, bonus, co-operative society, consols, stock, annuity.

OR

Geometry.

1. As First Year, etc.
2. Prove I. 41 and 45.

Needlework.

1. As First Year.

TO STUDENTS.

I shall be glad to help students by examining for them specimen answers in each subject for the nominal fee of two shillings and sixpence per set, the postage being paid by the student both ways.

Students who wish to avail themselves of this will please answer the *second* question in each subject in the test questions given this month.—J.C.H.

qualities. In this view each mind has as a natural endowment the power of appreciating the difference between virtuous and vicious acts. That is, morality depends more on Feeling than Reason.

Conscience is the power the mind possesses of discovering universal truth. It is a sort of higher reflective principle which reviews the actions as tested by the accepted principles, and passes judgment thereon. Butler is the great exponent and defender of the supremacy of Conscience. It originates on, and has authority over, the Self, and involves two separate ideas—(1) feeling of pleasure and pain, (2) judgment.

Intuitionists consider conscience as an innate mental power; but Bain, following the Utilitarian school, considers it as a product of experience.

What is acceptable to all schools is, that every child is born with certain tendencies due to family and racial evolution, but these are developed by the exercise which is given in a properly organised educational system.

6. What do we mean by the Will?

Some philosophers regard it as a special faculty. Locke describes it as 'the power to begin or forbear, continue or end actions of our minds and motions of our bodies, by a thought or preference of the mind, ordering, or, as it were, commanding the doing or not doing.' Bain considers Will as resolvable into action and feeling. To the teacher it is not of much importance, which view is taken because it is 'acts of Will' with which the educator has to do. The proper development of Will-power and its training so as to obtain a fixed disposition towards right action is moral education. In this view we have in ascending order, as the aim of a good school, Instruction, Education, Morality.

SYLLABUS OF WORK FOR THE MONTH.

Students are advised not only to get up the work indicated, but also to use the test questions as indications of work to be got up and afterwards written out.

FIRST YEAR.

School Management.

1. Infant school discipline.
2. Drawing and Science—their place in a Primary school curriculum.
3. The principles and limits of the Kindergarten.
4. Comparison of the ordinary Standard requirements with the special courses for small schools.

Composition.

1. Lamb's style.
2. Individualism.
3. Socialism.
4. Rewards and Punishments.

Arithmetic.

Not less than six examples from miscellaneous sets ought to be worked per week, as well as some on the particular work set and the examination questions given.

1. Theory of Subtraction—Multiplication of Fractions.
2. Theory of Remainder in Division—Position of Decimal point in Multiplication.
3. Mensuration of the Circle—Square measure and its relation to papering, carpeting, and land measurements.
4. Interest—Discount—Profit and Loss.

Music.

1. Requirements and writing tests for Div. I. and III.
2. Musical terms—Metronome.
3. Requirements and tests for Div. II. and IV.
4. Mental effects—Lah mode.

English.

1. Inflection of nouns and history of them.
2. Latin and Modern elements in English.
3. Adjectives—their history and inflection.
4. Greek and modern elements in English.

Literature.

1. Lamb's Essays, 'Old Actors': Wordsworth, 'Ballad Poems.'
2. ,, ,, 'Roast Pig': ,, Lyrics (1st half).
3. ,, ,, 'Chimney Sweepers': Wordsworth, 'Dion,' 'Immortality.'
4. ,, 'Dream Children': Wordsworth, Lyrics (2nd half).

Geography.

1. Ireland (physical)—Belgium—Denmark.
2. ,, (political)—Switzerland—Greece.
3. ,, (railways—trade)—Italy—Portugal.
4. ,, (ports, canals, telegraphs, etc.)—Spain.

History.

1. Geo. I.—More—Chartists.
2. Commonwealth—Dundee—Irish Parliamentary Union.
3. Geo. II.—American War of Independence.
4. Charles II.—Petition of Right—Bill of Right.

MEN ONLY.

Algebra.

1. Theory of S. Equations and H.C.F.
2. Theory of ratio and Proportion, L.C.M.
3. Factors—Arithmetic Progression.
4. Factors—Variation.

N.B.—Exercises should be worked on these subjects as well as the bookwork got up.

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QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

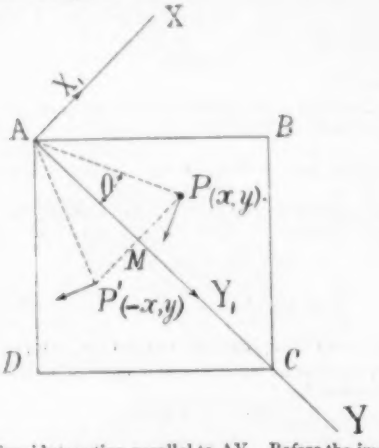
Carolus.—A square ABCD moves in its own plane with a given velocity of translation parallel to BA; it meets with an obstacle such that A becomes suddenly fixed; find the motion of the square immediately after the impact, and the magnitude and direction of the blow which it receives from the obstacle.

(Science and Art, 1894.)

Let v = velocity of square before impact.
ω = angular velocity of square immediately after impact.
M = mass of square (not M in figure).
I = moment of inertia of square about an axis through A, perpendicular to plane of square.

Let the components of the blow or impulse on the square parallel and perpendicular to the diagonal AC be called Y_1 and X_1 respectively.

Remember that an impulse is measured by the change of linear momentum which it produces parallel to the line of action of the impulse.



1. Consider motion parallel to AY. Before the impact every particle composing the square is moving parallel to OY with velocity $v \cos 45^\circ = \frac{v}{\sqrt{2}}$.

Hence momentum before impact $\Sigma\frac{mv}{\sqrt{2}} = \frac{Mv}{\sqrt{2}}$.

Immediately after the impact a small particle at P whose coordinates are x_1, y_1, has a velocity of ωAP sin θ parallel to AY, and *away from* A. But for every such particle as P there is a corresponding one P^1 (co-ordinates $-x_1$, y_1), which has a velocity parallel to AY equal in magnitude to that of P, only *towards* A.

Hence total momentum parallel to AY $= \Sigma m\omega$. AP sin θ
$=$ zero.

Therefore Y_1 = change of linear momentum parallel to AY
$= \frac{Mv}{\sqrt{2}}$ . . . . (1)

2. Consider motion parallel to AX.

Momentum before impact $= \frac{Mv}{\sqrt{2}}$.

Momentum after impact $= \Sigma m\omega$. AP cos θ
$= M\omega\Sigma$AM
$= \frac{M\omega l}{\sqrt{2}}$.

$\therefore X_1 = \frac{Mv}{\sqrt{2}} - \frac{M\omega l}{\sqrt{2}}$ . . . . (2)

3. Change of moment of momentum about A = moment of impulse about A.

$$\therefore Mv \cdot \frac{l}{2} - \Sigma m\omega \text{AP} \times \text{AP} = 0.$$

$$\frac{Mvl}{2} - \omega\Sigma m \cdot \text{AP}^2 = 0 \therefore I\omega = \frac{Mvl}{2} \text{ and } \omega = \frac{Mvl}{2I}.$$

$$\text{But } I = \frac{2}{3} M l^2 \therefore \omega = \frac{3v}{4l} \quad . \quad . \quad . \quad . \quad (3)$$

From (2) and (3) we get $X_1 = \frac{Mv}{4\sqrt{2}}$.

The impulse being the resultant of X_1 and Y_1, its magnitude and direction are easily found.

They are $\frac{\sqrt{34}Mv}{8}$, and 30° 48′ with AB.

[N.B.—Any two perpendicular axes might have been chosen. The two that we have taken are convenient, but axes coinciding with AB and AD would have been quite as much so. We would advise you to work out the problem again, taking the latter as axes.]

A. Paddison.—Show that the radius of a curvature of the envelope of the line $x \cos \alpha + y \sin \alpha = f(\alpha)$ is $f(\alpha) + f''(\alpha)$; and that the centre of curvature is at the point

$$x = -f'(\alpha) \sin \alpha - f''(\alpha) \cos \alpha.$$
$$y = f'(\alpha) \cos \alpha - f''(\alpha) \sin \alpha.$$

(Edwards' 'Differential Calculus,' p. 172.)

If one of the values of α be called α_1, then the equation

$$x \cos \alpha_1 + y \sin \alpha_1 = f(\alpha_1)$$

represents a straight line, and α_1 is the angle which the perpendicular from the origin to the straight line makes with the axis of x. The length of this perpendicular is $f(\alpha_1)$. The envelope is the curve to which all the straight lines represented by

$$x \cos \alpha + y \sin \alpha = f(\alpha)$$

are tangential.

Now the equation to a curve may be given in terms of p, the perpendicular from origin to tangent, and ϕ, the angle which the tangent makes with the axis of x. This is called the *tangential-polar* form of equation.

We know that the radius of curvature,

$$\rho = p + \frac{d^2p}{d\phi^2}.$$

You will see by drawing a figure that

$$\phi = \frac{\pi}{2} + \alpha.$$

$$\therefore \frac{d\phi}{d\alpha} = 1.$$

$$\text{hence } \rho = p + \frac{d^2p}{d\alpha^2} = f(\alpha) + f''(\alpha).$$

Next, to find the coordinate, $\bar{x}$, $\bar{y}$, of the centre of curvature. It is shown in your text-book that

$$\bar{x} = x - \rho \sin \phi,$$
$$\bar{y} = y + \rho \cos \phi,$$

where ϕ is the angle which the tangent at any point x, y, of the envelope makes with axis of x.

If we take the two equations

$$x \cos \alpha + y \sin \alpha - f(\alpha) = 0,$$
$$-x \sin \alpha + y \cos \alpha - f'(\alpha) = 0,$$

any value of x which satisfies both these equations will be the x coordinate of a point on the envelope. Multiplying the first equation by cos α, the second by sin α, and subtracting, we get

$$x = f(\alpha) \cos \alpha - f'(\alpha) \sin \alpha.$$

Hence $\bar{x} = x - \rho \sin \phi$
$= x - \rho \cos \alpha$
$= f(\alpha) \cos \alpha - f'(\alpha) \sin \alpha - f(\alpha) \cos \alpha - f''(\alpha) \cos \alpha$
$= -f'(\alpha) \sin \alpha - f''(\alpha) \cos \alpha.$

The other coordinate $\bar{y}$ is found in exactly the same manner.

A. Brown.—One man's pace is $2\frac{9}{11}$ feet; and another is $2\frac{3}{12}$ feet; if they start together, how far will they walk before they are in step again? ('P. T.,' March.)

If we call the first man A, and the second B, then B's pace is $\frac{2\frac{3}{12}}{2\frac{9}{11}} = \frac{319}{351}$ of A's pace.

Hence 351 of B's strides = 319 of A's; therefore they will be in step again when A has made 319 strides, when they will each have gone $\frac{319 \times 27}{11} = \underline{783 \text{ feet}}$.

'A New Reader.'—A small error x is made in measuring the side of a triangle, and a small error y in measuring b, and a small error n'' in measuring C. Prove that the consequent errors in A and B are each $\frac{1}{2}n''$, provided the relation

$$2\,\frac{bx-ay}{a^2-b^2}\sin C = n \sin 1''$$

be satisfied. (Indian Civil Service, 1892.)

Let $n'' = z$ radians.

The independent variables are a, b, C, and dependent variable is A. We must therefore get an equation connecting these four quantities.

$$\frac{b}{a} = \frac{\sin A}{\sin B} = \frac{\sin(A+C)}{\sin A} = \frac{\sin A\cos C + \cos A \sin C}{\sin A}$$
$$= \cos C + \cot A \sin C,$$
$$\therefore \cot A = \frac{b}{a\sin C} - \cot C \quad \ldots\ldots \quad (1)$$

Now if dA be the small increment in A due to small increments in a, b, and C, of amounts da, db, and dC, we know that

$$dA = \frac{\delta A}{\delta a}da + \frac{\delta A}{\delta b}db + \frac{\delta A}{\delta C}dC.$$

$\frac{\delta A}{\delta a}$ is the partial differential of A with respect to a, b and C being supposed constant.

From equation (1) we get, by differentiation,

$$-\operatorname{cosec}^2 A\,\frac{\delta A}{\delta a} = -\frac{b\operatorname{cosec} C}{a^2};\ \therefore \frac{\delta A}{\delta a} = \frac{b}{a^2}\,\frac{\sin^2 A}{\sin C}$$

In a similar manner we find that

$$\frac{\delta A}{\delta b} = -\frac{\sin^2 A}{a\sin C},$$

$$\text{and } \frac{\delta A}{\delta C} = \frac{b}{a}\,\frac{\cos C\sin^2 A}{\sin^2 C} - \frac{\sin^2 A}{\sin^2 C} = \frac{b}{a}\cos C\,\frac{a^2}{c^2} - \frac{a^2}{c^2}$$
$$= \frac{a^2}{c^2}\left(\frac{b\cos C - a}{a}\right) = -\frac{a}{c}\cos B.$$
$$\therefore dA = \frac{xb\sin^2 A}{a^2\sin C} - \frac{y\sin^2 A}{a\sin C} - \frac{az\cos B}{c}$$
$$= \frac{\sin^2 A\,(bx-ay)}{a^2\sin C} - \frac{za(a^2-b^2+c^2)}{C\times 2ac}$$
$$= \frac{\sin C\,(bx-ay)}{c^2} - \frac{z(a^2-b^2)}{2c^2} - \frac{z}{2}.$$

Hence if

$$\frac{2(bx-ay)\sin C + z(a^2-b^2)}{2c^2} = 0,$$

that is, if

$$\frac{2(bx-ay)\sin C}{a^2-b^2} = z,$$

then dA will be equal to

$$-\frac{z}{2}\text{ radians, or } -\frac{n''}{2}.$$

The circular measure of $1''$ is $\sin 1''$ very approximately,

$$\therefore z = n\sin 1''.$$

A.W.B.—
$$x^3(y-z)+y^3(z-x)+z^3(x-y)$$
$$= x^3y - x^3z + y^3z - y^3x + z^3x - z^3y$$
$$= x(x^2y - x^2z - y^3 + z^3) + y^3z - z^3y$$
$$= x[x^2(y-z) + (z-y)(z^2+zy+y^2)] + yz(y^2-z^2)$$
$$= x[(y-z)\{x^2 - z^2 - zy - y^2\}] + yz(y+z)(y-z)$$
$$= x[(y-z)\{x^2 - y^2 - z(y+z)\}] + yz(y+z)(y-z)$$
$$= x[(y-z)\{(x+y)(x-y) - (y+z)z\}] + yz(y+z)(y-z)$$
$$= (y-z)\{x(x+y)(x-y) - xz(y+z) + yz(y+z)\}$$
$$= (y-z)\{x(x+y)(x-y) - (y+z)z(x-y)\}$$
$$= (y-z)(x-y)\{x(x+y) - z(y+z)\}$$
$$= (y-z)(x-y)\{x^2 - z^2 + xy - zy\}$$
$$= (y-z)(x-y)\{(x-z)(x+z) + y(x-z)\}$$
$$= (y-z)(x-y)(x-z)(x+y+z).$$

C.H.T.—If two circles touch one another internally, and any third circle be described touching both; then the sum of the distances of the centre of this third circle from the centres of the two given circles is constant. (Hall and Stevens, p. 218.)

Let A and B be the centres of the given fixed circles, and C the centre of any circle which touches both.

Join BC; then it passes through E, the point of contact of the circles, centres B and C, hence BC = BE + EC.

Join AC, and produce it; it will pass through D, the point of contact of circles, centres A, C; hence AC = AD − CD.

$$\therefore BC + AC = BE + EC + AD - CD$$
$$= BE + AD = \text{constant.}$$

Gyp.—In a cricket match the scores in each successive innings are a quarter less than in the preceding innings, and the side which had the first innings wins by 50. What are the scores in each innings? (H. Smith's 'Arith. Exam. Papers,' 284.)

The second score = $\frac{3}{4}$ of first score.
The third score = $\frac{3}{4}$ of second = $\frac{9}{16}$ of first.
The last score = $\frac{3}{4}$ of third = $\frac{27}{64}$ of first.

Hence the side which batted first scores altogether $1\frac{9}{16}$ of first score. The other side scores altogether $\frac{3}{4} + \frac{27}{64} = \frac{39}{64}$ of first score.

The difference of the two totals is 50.

$\therefore 1\frac{9}{16}$ of first score $- \frac{39}{64}$ of first score = 50,

$$\text{or } \frac{100-75}{64}\times \text{first score} = 50.$$
$$\therefore \text{first score} = \frac{50\times 64}{25} = 128.$$

The four scores were 128, 96, 72, 54. Answer.

C.H.T.—If three circles touch one another two and two, prove that the tangents drawn to them on the three points of contact are concurrent and equal. (Hall and Stevens, p. 218.)

Let A, B, C, be the centres; D, E, F, the points of contact of A and B, B and C, C and A.

Draw the common tangents at D and E; they meet at O, therefore OD = OE (III. 17, Cor.).

Draw the common tangent at F; let it meet OD in G, and OE produced in H, then

$$FG = GD \text{ (III. 17, Cor.)} = OD - OG$$
$$= OE - OG.$$
$$HF = HE = HO + OE.$$
$$\therefore HF - FG = HO + OG.$$
$$\therefore HG = HO + OG.$$

Or one side of the triangle, HOG, is equal to the other two sides. This is impossible so long as HG and O do not coincide. Hence the three tangents meet at O. They are evidently equal from III. 17, Cor.

X.Y.Z.—A rigid bar AB is trisected at the points C and D, and has three particles, each of weight equal to its own, attached at the three points C, D, B. If the bar be resting on a table, find the point at which it must be struck so as to begin to rotate about A. (London B.Sc., 1894.)

In the case of a rigid body suspended freely about an axis, if k be the radius of gyration of the body with reference to the axis of suspension, and h the distance of the centre of gravity below the centre of suspension, then $\frac{k^2}{h}$ is the distance of the *centre of percussion* from the latter point.

If the body be suspended and at rest in a vertical position, and it be struck horizontally through the centre of percussion, there will be no impulsive force on the axis of suspension.

Hence if the rigid bar AB is to begin to rotate about A, it must be struck perpendicularly to itself at a point distant $\frac{k^2}{h}$ from A.

Let m = the mass of the bar, and of each of the weights.
l = length of AB,
and G the position of the centre of gravity of the whole system.

You will easily make out that AG = $\frac{5}{6}l$.

The moment of inertia of the bar alone about A = $\frac{ml^2}{3}$.

The moment of inertia of the particle at C about A = $\frac{ml^2}{9}$.

The moment of inertia of the particle at D about A = $\frac{4ml^2}{9}$

The moment of inertia of the particle at B about A = ml^2.

$\therefore$ total moments of inertia about A = $\frac{17}{9}ml^2$.

This is equal to $k^2 \times 4m$.

$$\therefore k^2 = \tfrac{17}{36}l^2.$$

Hence $\frac{k^2}{h} = \frac{17}{36}l^2 \div \frac{5}{6}l = \frac{17}{30}l$.

If the bar is of uniform section and density, in order that it may begin to rotate about A, it must be struck perpendicularly to itself at a point $\frac{17}{30}$ of its length from the end A.

OUR SCIENCE SECTION

NOTES ON PHYSIOLOGY:

EMBRACING THE SUBJECTS OF THE ADVANCED AND HONOURS STAGES, SCIENCE AND ART DEPARTMENT.

BY WALKER OVEREND, M.A., M.D. (OXON), B.SC. (LONDON),

Physician to the Tottenham Hospital;
Late Radcliffe Fellow, Scholar of Balliol College, and Exhibitioner in Comparative Anatomy of the London University.

1. *Summary of the Chemical Changes undergone by Food in the Alimentary Canal.*—In the mouth the food is broken up by the teeth and moistened with the alkaline saliva in order to fit it for deglutition. Some of the starch is converted by the *ptyalin* of the saliva into dextrine and maltose.

In the stomach the conversion of starch into maltose proceeds for about half an hour, at the end of which time the amount of gastric juice secreted by the glands is sufficient to neutralise the alkalinity of the saliva, when the action stops. The masticated food is gradually converted into a soup-like fluid called *chyme*—the proteid matter, for the most part, is dissolved and converted into albumose and *peptone*. Connective tissue is also dissolved, but the fat is scarcely attacked: at the most, only the proteid envelopes of the fat cells. During this time also the peptones and maltose, also the sugar taken in with the food, are being absorbed by the gastric mucous membrane. At the end of about two hours the sphincter at the pyloric end becomes gradually relaxed, and the chyme is ejected by the movements of the muscular coat into the duodenum. This process goes on for several hours, the sphincter becoming more and more relaxed, and at the end even large lumps of undigested proteid and starchy food are allowed to enter the duodenum. In the duodenum the contact of the acid fluid with the mucous coat in the duodenum induces a more copious flow of bile and pancreatic juice. These fluids are alkaline, and they gradually neutralise the acidity of the chyme. A slight precipitation of albumose and acid albumin occurs, which is dissolved later on by the *trypsin* of the pancreatic juice. Undigested proteids are rapidly converted into peptone, and this is also partially split up into leucin and tyrosin. The conversion of escaped starch into maltose is also recommenced.

The pancreatic juice splits up a part of the fat into fatty acid and glycerin and the sodium carbonate of the pancreatic juice combines with the fatty acid. The sodium salt thus formed favours the emulsification of the fat.

Certain fermentative changes convert some of the carbohydrates into lactic acid, so that by the time the food has reached the large intestine it is again acid in reaction. By the abstraction of the soluble and more liquid portions the chyme in the large intestine becomes firm and solid, also of a dark brown colour from admixture with bile.

Very nearly all the fat absorbed from the bowel takes the path of the lacteals. The water, salts, and sugar pass readily into the capillary network around the villi and reach the veins of the portal circulation, thus passing through the liver. The peptone is absorbed by the epithelial cells lining the villi and the mucous membrane of the stomach; then it appears to be converted into a soluble form of albumin, and afterwards conveyed by the portal radicles to the liver. Ligature of the thoracic duct before digestion does not interfere with the absorption of the peptone, thus showing that it does not enter the lacteals.

2. *The nature, uses, and fate of Glycogen.*—Glycogen is a carbohydrate, and consists of carbon, hydrogen, and oxygen, the two latter existing in the same proportion as they exist in water. Their formula is $C_6H_{10}O_5$. Glycogen is found in the liver and muscles of the body. It is a white powdery substance, soluble in cold water, producing a slightly milky solution. When tincture of iodine is added a reddish colour is produced. When alcohol is added to a solution of glycogen in water the glycogen falls as a white precipitate.

Immediately after death the liver does not contain any sugar. When the organ is rapidly removed from a rabbit just killed, cut up, and thrown into boiling water an opalescent solution is obtained. If filtered and alcohol added, a precipitate falls, which is glycogen.

The blood of the hepatic veins contains a greater percentage of sugar than the blood coming to the liver in the portal vein. Also, if the liver be removed from the animal a few hours after death it is found to contain much sugar. The glycogen existing in the liver has apparently been converted (and by fermentation) into sugar.

As to the uses (function) and fate of glycogen there are several views. One of these assumes that it is made use of in the formation of fat. Its chief use, however, seems to be the maintenance of a normal percentage of sugar in the blood, as an average blood contains about 0·1 per cent. of sugar. If this be increased, as by the injection of sugar into the veins of a dog, the amount of sugar may rise to three-tenths, and the excess of sugar is rapidly eliminated by the kidneys, and appears in the urine. After a meal rich in sugar or starch, a large amount of sugar passes into the portal vein: many hundred grammes may thus enter the portal vein, but still no trace of sugar is found in the urine. The liver seizes on the excess of sugar passing through its substance, and transforms it by the active agency of its cells into glycogen, which is deposited within them.

Glycogen is present in the muscles, and serves as a local supply of reserve material for the evolution of muscular energy. Glycogen is conveyed to the muscles as sugar.

A New British Plant.—A new labiate (*Stachys alpina*) has recently been added, by Mr. Cedric Bucknall, to British plants. He found it on the Cotswold Hills near Wotton-under-Edge, apparently in a truly wild state.

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Mineral Salts and the Growth of Cereals.—M. C. Dassonville has recently made some interesting experiments to ascertain the effect of solutions of various mineral salts, especially of Knop's solution, on the growth of cereals as compared with that of pure water. He finds, as a general result, that with distilled water the tissues are less fully developed, but more strongly lignified. In a saline solution both the roots and the stem become longer, the size both of the vessels and the air cavities is increased, while the walls of the vessels are less strongly lignified.

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The Reason of the Sleep of Plants.—Herr Stahl has been examining a large number of plants in order to ascertain the reason of the sleep of plants. He is of opinion that the nocturnal position of the leaf, or leaflets, acts as a protection against the deposition of dew, and thus promotes transpiration, and increases the amount of nutriment conveyed to the assimilating organs by the ascent of water in the stem. This he thinks its main function rather than the prevention of excessive radiation. The nocturnal position of the leaf or leaflets he classifies under two heads. Firstly, they are directed downwards, so that the under side is better directed than the upper side against the deposition of dew [*Biophytum sensitivum*, *Oxalis acetosella*, *Robinia pseudacacia*, *Hedysarum gyrans*, *Impatiens noli-me-tangere*]. Again they are so placed that the upper side is better protected than the under side against the deposition of dew [*Colutea arborescens*, *Trifolium repens*, *Impatiens glandulifera*]. Correlated with this difference there is usually a difference in the disposition of these stomates on the two surfaces, but this is by no means always the case. Geotropism also, it is probable, has some share in producing the vertical nocturnal position of leaves and leaflets.

DIFFERENTIAL AND INTEGRAL CALCULUS FOR BEGINNERS.

FUNCTIONS (*continued*).

Problem.—A point moves so that the sum of its distances from two fixed points remains constant. Determine the locus of the point.

Take the line through the two fixed points as the x axis, the y axis being drawn perpendicular to this line midway between the two points. Let the distance from the origin to either of the fixed points $= \delta$.

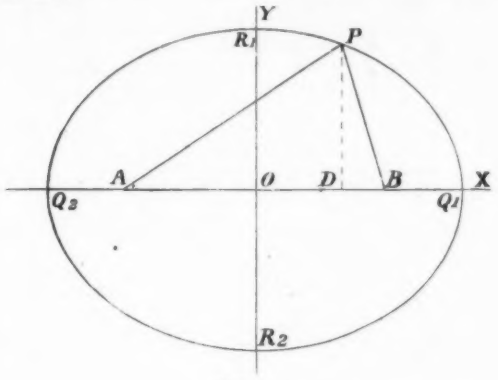

FIG. 1.

Let P be a point on the curve, A and B being the two fixed points, and draw PD perpendicular to the x axis. Then

$$PB^2 = PD^2 + DB^2$$
$$PA^2 = PD^2 + AD^2.$$

Also, since $PD = y$, $OD = x$, $DB = \delta - x$, $AD = \delta + x$, we shall have, if the constant sum of the distances of P from A and B $= c$,

$$\{(\delta + x)^2 + y^2\}^{\frac{1}{2}} + \{(\delta - x)^2 + y^2\}^{\frac{1}{2}} = C.$$

$$\therefore (\delta + x)^2 + y^2 = [c - \{(\delta - x)^2 + y^2\}^{\frac{1}{2}}]^2.$$

$$\delta^2 + 2\delta x + x^2 + y^2 = c^2 - 2c\{(\delta - x)^2 + y^2\}^{\frac{1}{2}} + \delta^2 - 2\delta x + x^2 + y^2.$$

Hence $c^2 - 4\delta x = 2c\sqrt{(\delta - x)^2 + y^2}$.

Squaring both sides, we get

$$c^4 - 8c^2\delta x + 16\delta^2 x^2 = 4c^2((\delta - x)^2 + y^2) = 4c^2(\delta^2 - 2\delta x + x^2 + y^2).$$

Collecting terms in x^2 and y^2—

$$4x^2(c^2 - 4\delta^2) + 4c^2y^2 = c^2(c^2 - 4\delta^2)$$

$$\therefore \frac{x^2}{\frac{c^2}{4}} + \frac{y^2}{\frac{c^2 - 4\delta^2}{4}} = 1. \quad \ldots \quad (1)$$

This is the equation to the curve in terms of the constants given in the problem. It may easily be put in a simple form.

Let $y = 0$. Then the two values obtained for x will give the points where the curve cuts the axis of x.

$$x = \pm\frac{c}{2} = OQ_1 \text{ or } OQ_2.$$

Similarly, equating x to zero, we get

$$y = \pm\frac{\sqrt{c^2 - 4\delta^2}}{2} = OR_1 \text{ or } OR_2.$$

The student should verify these values of OQ and OR from first principles.

The curve obtained is called an *ellipse*, of which A and B are the two *foci*. OQ is called the *semi-axis major*, and OR is called the *semi-axis minor*.

Let $OQ_1 = a$, $OR_1 = b$. Then the equation to the ellipse may be written—

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1. \quad \ldots \quad (2)$$

Example 1.—The major and minor axes of an ellipse are respectively 20 cm. and 10 cm. in length, find the equation of the ellipse, also the distance from the origin to the foci.

Answer. $\frac{x^2}{100} + \frac{y^2}{25} = 1.$

Distance of focus from origin $= \sqrt{75}$ cm.

(The latter follows from the equations

$$\frac{c}{2} = 10, \quad \frac{\sqrt{c^2 - 4\delta^2}}{2} = 5.)$$

Example (2).—Write the equation of the ellipse in the form $y = f(x)$.

Answer. $y = b\sqrt{1 - \frac{x^2}{a^2}}$, or $\sqrt{b^2 - \frac{b^2}{a^2}x^2}$.

Problem.—A point moves so that the *difference* between its distances from two fixed points remains constant. Find the locus of the point.

Answer.—The equation may be found, in a manner similar to that used above, to be

$$\frac{x^2}{\frac{c^2}{4}} - \frac{y^2}{\frac{4\delta^2 - c^2}{4}} = 1.$$

Transform as above to the form $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

This curve is called a *Hyperbola*. The student should draw the curve, and make himself acquainted with its form.

Problem.—A point moves so that its distance from a fixed point is equal to its perpendicular distance from a given straight line. Find the locus of the point.

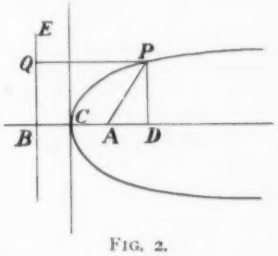

FIG. 2.

Take the line AB through the fixed point A, and perpendicular to the given straight line BD, as the axis of x. Bisect AB in C. Then it is easily seen that C will be a point on the curve. Let CY be taken as the axis of y. Also let $CA = CB = a$.

Take any point P on the curve, and draw PD perpendicular to the axis of x. Then

$$AP^2 = AD^2 + DP^2.$$

Draw PQ perpendicular to BE. Then by the condition of the problem

$$PA = PQ = BD = BC + CD = a + x.$$
$$AD = CD - CA = x - a, \text{ and } DP = Y.$$

Then $\{(x - a)^2 + y^2\}^{\frac{1}{2}} = a + x.$

Squaring, $x^2 - 2ax + a^2 + y^2 = a^2 + 2ax + x^2.$

$$\therefore y^2 = 4ax.$$

This is the equation of the required locus.

The above curve is termed a *Parabola*, of which A is the *focus*, and BE is the *directrix*.

It remains to consider a class of functions of the greatest importance, termed exponential functions. These functions are commonly treated of in books on Algebra and Trigonometry. A brief consideration of them will be given here, as the student's attention must be directed particularly to one or two points.

Let it be required to expand a^x in a series of ascending powers of x.

(It is assumed that the student is acquainted with the Binomial Theorem that

$$(a + x)^n = a^n + na^{n-1} + \frac{n(n-1)}{1.2}a^{n-2}x^2 + \frac{n(n-1)(n-2)}{1.2.3}a^{n-3}x^3 + \ldots\ldots$$

This theorem will be frequently used during the development of the subject.)

Then $a^x = (1 + \overline{a - 1})^x$

$$= 1 + x(a - 1) + \frac{x(x-1)}{1.2}(a - 1)^2 + \frac{x(x-1)(x-2)}{1.2.3}(a - 1)^3 + \ldots\ldots, \text{ etc.}$$

Rearrange this expression in a series of ascending powers of x.

$$a^x = 1 + x\left\{a-1+\frac{1}{1.2}a-1^2+\frac{1.2}{1.2.3}a-1^3 + \frac{1.2.3}{1.2.3.4}a-1^4+\ldots\ldots\right\} + \text{terms in } x^2,\ x^3, \text{ etc.}$$

The required series may therefore be written

$$a^x = 1 + Ax + Bx^2 + Cx^3 + Dx^4 + \ldots\ldots, \quad (3)$$

where

$$A = a-1+\tfrac{1}{2}a-1^2+\tfrac{1}{3}a-1^3+\tfrac{1}{4}a-1^4+\ldots\ldots; \quad (4)$$

We will now proceed to determine B, C, D, etc.

Since a^y is obtained from a^x by simply changing x into y, we see that

$$a^y = 1 + Ay + By^2 + Cy^3 + Dy^4 + \ldots\ldots \quad (5)$$

According to the theory of indices—

$$a^{(x+y)} = a^x \times a^y.$$

Hence

$$a^{(x+y)} = 1 + A(x+y) + B(x+y)^2 + C(x+y)^3 + D(x+y)^4$$
$$= a^x \times a^y = (1 + Ax + Bx^2 + Cx^3 + Dx^3 + \ldots\ldots)$$
$$(1 + Ay + By^2 + Cy^3 + Dy^4 + \ldots\ldots).$$

Multiplying together the two series whose product $= a^x.a^y.$, we get

$$a^x.a^y = 1 + A(x+y) + \{B(x^2+y^2) + A^2xy\} + \{C(x^3+y^3) + AB(x^2y+xy^2)\} + \ldots\ldots$$

Since this series must be, term for term, identical with the series for $a^{(x+y)}$, and since the first two terms of both series are identical as they stand, we get

$$B(x+y)^2 = B(x^2+y^2+2xy) = B(x^2+y^2) + A^2xy.$$

Hence

$$2B = A^2;\ \therefore B = \frac{A^2}{2}.$$

Similarly

$$C(x^3+y^3+3x^2y+3xy^2) = C(x^3+y^3) + AB(x^2y+xy^2).$$
$$\therefore 3C = AB;\ \therefore C = \frac{AB}{3} = \frac{A^3}{2.3}.$$

Similarly it may be shown that

$$D = \frac{A^4}{1.2.3.4},\quad E = \frac{A^5}{1.2.3.4.5}.$$

Finally

$$a^x = 1 + Ax + \frac{A^2}{1.2}x^2 + \frac{A^3}{1.2.3}x^3 + \frac{A^4}{1.2.3.4}x^4 + \ldots\ldots \quad (6)$$

where A has the value given in (4).

Take the case when $A = 1$, *i.e.*, when the series $a-1+\frac{1}{2}a-1^2+\frac{1}{3}a-1^3+\ldots\ldots = 1$. Let the value of a, which will make this series $= 1$, be denoted by ϵ. Then

$$\epsilon^x = 1 + x + \frac{x^2}{|2} + \frac{x^3}{|3} + \frac{x^4}{|4} + \ldots\ldots \quad (7)$$

To find ϵ, put $x = 1$. Then

$$\epsilon(=\epsilon^1) = 1 + 1 + \frac{1}{|2} + \frac{1}{|3} + \frac{1}{|4} + \ldots\ldots$$

Exercise.—Calculate the value of ϵ correctly to 5 places of decimals.

Now a may obviously be written ϵ^y; and since y here indicates the power to which ϵ must be raised, in order to equal a, y may be written as $\log_\epsilon a$.

$$\text{Then } a^x = \epsilon^{(\log_\epsilon a.x)} = 1 + \log_\epsilon a.x + \frac{(\log_\epsilon a)^2}{|2}x^2 + \frac{(\log_\epsilon a)^3}{|3}x^3 + \ldots\ldots$$

Comparing this result with (6), we see that

$$\log_\epsilon(a) = a-1+\tfrac{1}{2}a-1^2+\tfrac{1}{3}a-1^3+\ldots\ldots \quad (8)$$

As we proceed with the study of the Calculus, it will become clear that the importance attaching to logarithmic and exponential functions is due to certain properties of the series given in (7) and (8).

Exercise.—Plot the curve $y = \epsilon^x$ for values of x between 0 and 2. (Substitute 0, ·25, ·5, ·75, 1, 1·5, and 2 for x in (7), calculating your results to two places of decimals.)

Exercise.—Plot the curve $y = \epsilon^{-x}$ for values of x between 0 and 2.

Exercise.—Plot the curves $y = \frac{\epsilon^x + \epsilon^{-x}}{2}$ and $y = \frac{\epsilon^x - \epsilon^{-x}}{2}$.

(Note that

$$\frac{\epsilon^x + \epsilon^{-x}}{2} = 1 + \frac{x^2}{|2} + \frac{x^4}{|4} + \ldots\ldots,$$

a series involving only *even* powers of x.

On the other hand

$$\frac{\epsilon^x - \epsilon^{-x}}{2} = x + \frac{x^3}{|3} + \frac{x^5}{|5} + \ldots\ldots,$$

a series involving only *odd* powers of x.

The two functions given in the latter exercise will be found of great importance as we proceed.)

We have now given a brief consideration to those functions which are most likely to occur in physical investigations. In our next article we shall be in a position to commence to develop the principles of the Calculus as applied to these functions.

(*To be continued.*)

SCIENCE NOTES.

The Ferment Zymase.—There has recently been obtained from yeast cells a substance which produces alcoholic fermentation without the presence of any living organism in cane, grape, fruit, and malt sugars. Professor Buchner finds, however, that this ferment, which he calls zymase, has no effect on mannite or milk sugar. It is nearly allied to, but not identical with, protoplasm, and Professor Buchner regards it as belonging to the group of genuine proteids.

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The Leaves of Fruit Trees.—In a recent number of the *Comptes Rendus*, M. Jacquemin states that plants which have fragrant or sapid fruits—such as the raspberry, apple, and pear—have an aromatic principle in their leaves. When they are immersed in a saccharine fluid, together with *Saccharomyces* or some other enzyme, the fluid will acquire both the flavour and the odour of the fruit, and the alcohol obtained by distillation from this fruit will possess the corresponding aromatic scent.

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The Distribution of British Mosses.—Mr. E. C. Horrell invites the co-operation of bryologists in working out the distribution of British mosses in districts similarly to Watson's distribution of flowering plants. Fairly good lists have been published for about fifty vice-counties, but there are about sixty-two vice-counties in Great Britain, for which he has not been able to find a list of the commoner British mosses. Mr. Horrell would much like to find a moss student in each vice-county, who would undertake to send him a list of the mosses of his district during the next two or three years. His address is 44, Brompton Square, S.W.

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A New Way of Feeding Plants.—M. Georges Truiffent has recently hit upon a new way of administering artificial food to plants. After the ash of the living plant has been analysed, the necessary salts for a given time, say six months, are weighed out and enclosed in a metal cover to form a pill. This is inserted in the pot, diffusion of the salts taking place through the folds of the metal, and the thicker the metal the slower the diffusion. As the salts dissolve and disappear, they are replaced by a core which expands until it completely fills the pill. The metal cover remains firm and hard, the salts having no action on it. The solubility of the salts can be so regulated that a pill may be made to last three or six months as may be desired. When this method of artificial feeding is resorted to, large, well-grown, well-coloured plants can be grown in pots of less than half the usual size.

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A New Method of Preserving Plant Colours.—A new method of preserving the green colour of plants for exhibition purposes seems to be similar in principle to the coppering of green peas. Air is removed from the surfaces and intercellular spaces of the plants as completely as possible, either by immersion in 90 to 95 per cent. alcohol, or by employing an air-pump. The plants are then immersed in dilute glycerine (5 per cent.), to which a bluish tint has been imparted by means of copper sulphate or acetate. The copper combines with the chlorophyll, forming copper phyllocyanate. This is almost insoluble in any ordinary preservative medium except strong alcohol, and is not affected by light. A mixture of dilute glycerine and formalin will dissolve out any access of copper salt. This may also be used with advantage as the preservative medium.

ELECTRICITY AND MAGNETISM.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

ADVANCED STAGE.

Problems connected with Condensers (continued).—The potential energy of a charged condenser is always equal to $\frac{1}{2}$ VQ, where V is the difference of potential between the plates, and Q is the charge.

When some other dielectric is substituted for air between the plates the energy is always altered. Whether the energy of the charged condenser is increased or decreased by the substitution of the dieleetric depends on the conditions of the charge.

1. *V constant.*—This corresponds to a condenser charged by means of a cell or other source of constant potential difference. For a plain condenser

$$V = \frac{4\pi\sigma}{K}T,$$

where σ = surface density of charge,
T = distance between condenser plates,
K = specific induction capacity of dielectric.
Also, if a = area of smaller plate, $Q = a\sigma$.

$$\therefore \text{energy} = \tfrac{1}{2}a\sigma.\frac{4\pi\sigma}{K}T$$

$$= \tfrac{1}{2}\frac{V.a.KV}{4\pi T} = \tfrac{1}{2}\frac{V^2Ka}{4\pi T}.$$

If air had been the dielectric (since the specific induction capacity of air = 1), the energy would have been

$$\tfrac{1}{2}\frac{V^2a}{4\pi T}.$$

Hence when a condenser is charged to a constant potential difference the energy of the charge is increased by substituting a dielectric (since K is never less than 1).

2. *Q constant.*—This corresponds to charging a perfectly insulating condenser in air, and then replacing the air between the plates by a dielectric

$$\tfrac{1}{2}QV = \tfrac{1}{2}Q.\frac{4\pi\sigma}{K}T = \frac{2\pi Q^2T}{aK}.$$

Hence the energy of the charge is in this case decreased by the introduction of the dielectric.

The student who has carefully followed the articles that have been given should be able to answer any question relating to condensers that could be set.

Problems such as the following are often found to be very difficult by students. After carefully studying the following argument any similar problem will be easily solved.

Question.—A, B, C are three similar cells, each of internal resistance = r, and E.M.F. = E. A and B are connected in series, the — pole of B being joined to the + pole of A. The — pole of C is then joined to the — pole of A, and the + pole of C to the + pole of B. A piece of wire of resistence = R is then connected between the — pole of A and the + pole of B. What current will flow through the wire, through C, and through A and B, respectively? (The resistence of connecting wires may be neglected.)

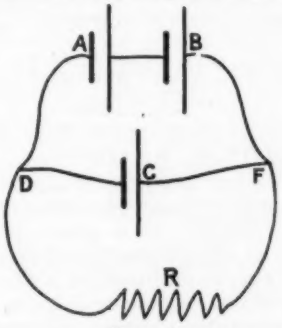

FIG. 1.

Let Fig. 1 represent the cells connected as required.

Problems of this kind are solved in accordance with the following principles:—

1. In taking a unit positive charge of electricity round any closed circuit, the work done will be equal to the impressed E.M.F. in that circuit.

2. Where a number of wires are joined at a point, the current carried to that point by some of the wires is just equal to the current carried away from that point by the rest of the wires.

To apply the above principles: Passing round the circuit DABFCD the impressed E.M.F. is the E.M.F. due to the chemical action in the cells—*i.e.*, 2 E, from D, through A and B, to E, and —E, from F through C to D, giving E in all.

Let c_1 = current through A and B (from A to B),
c_2 = ,, ,, C (from F to D),
c_3 = ,, ,, R (from F to D).

Then the fall of potential, due to the current c_1 flowing through the resistance $2r$ due to the cells A and B, = $2c_1r$.

Similarly, fall of potential due to c_2 flowing through C = c_2r,

Hence, from (I.),

$$2c_1r + c_2r = E \quad . \quad . \quad . \quad . \quad (1).$$

Similarly, passing round the circuit DCFRD, we get

$$-c_2r + c_3R = E \quad . \quad . \quad . \quad . \quad (2).$$

Also, the current c_1 flowing from B to F will be equal to $c_2 + c_3$, the current flowing away from F along FC and FR, by (II.).

$$\therefore c_1 = c_2 + c_3.$$

Substituting for c_3 in (2) we get

$$-c_2r + (c_1 - c_2)R = E.$$

Therefore (1) and (2) may be written

$$2rc_1 + rc_2 = E,$$
$$Rc_1 - (r + R)c_2 = E,$$

simultaneous equations to determine c_1 and c_2.

Solving these, we obtain

$$c_1(2r(r + R) + rR = E\{(r + R) + r\}.$$
$$\therefore c_1 = \frac{E(R + 2r)}{r(2r + 3R)}.$$

Similarly—

$$c_2 = \frac{E}{r} - 2c_1 = E\frac{2r + 3R - (R + 2r)}{r(2r + 3R)}$$
$$= E\frac{R}{r(2r + 3R)},$$
$$c_3 = c_1 - c_2 = E\frac{2r}{r(2r + 3R)}.$$

Particular cases.

When R is infinite $c_1 = E\dfrac{1 + \frac{2r}{R}}{r\left(\frac{2r}{R} + 3\right)} = \dfrac{E}{3r}$.

When R = 0 $\quad c_1 = \dfrac{E}{r}$.

The student is advised to work out in a similar manner the value of c_2 and c_3 under the conditions given, and to try and see the physical significance of the results obtained.

(*To be continued.*)

Electricity and Germination. — Some interesting recent experiments have been made at the Experiment Station, Amherst, Massachusetts, showing the effect of a continuous electric current on vegetation. With a small alternating current of moderate frequency and high voltage, there ensued in all the cases that were tried an increase in the rapidity of germination and of the elongation of the radicle and hypocotyl.

***

Storax and its Origin. — Storax has hitherto been considered a product of the bark. Dr. Moeller, of Gratz, is of opinion that it is a pathological secretion of the young wood. He has examined the tissues found in Oriental storax and the stems of the American *Liquidambar styraciflua*, which had been cut in order to cause a flow of the balsam. The latter tree is cut at intervals of three weeks in April, May, and June. Then the bark becomes raised from the wood, and the wood appears dead. The tissues of the wood become filled with yellow matter, and its vessels, together with the more central uninjured vessels, contain thyloses. The new wood is formed of a pathological parenchyma, in which schizogenous secreting cells appear, and ultimately unite to form lysigenous lacunæ containing freshly secreted balsam. This development of schizogenous cavities is at present unknown in other plants.

NOTES ON THEORETICAL MECHANICS.

BY F. CASTLE, M.I.M.E.,
Royal College of Science; Lecturer on Mechanics, Geometry, etc., Morley College, London.

ADVANCED AND HONOURS STAGES.

(*Continued from page* 567.)

Ex. 7. A horizontal disc of glass is held up by means of a film of water between it and a similar disc of the same or larger size above it. If R denote the radius of the lower disc, d the distance between the discs, which is small compared with R, show that the weight of the lower disc, together with that of the water between the discs is approximately equal to $\frac{2t\pi R^2}{d}$ (the radius of the concavity of the water may be taken as $\frac{1}{2}d$).

Solution, using the same notation as before :—

$$(P-p_1)d \times \delta x = 2t \cos a \,.\, \delta x.$$

$$\therefore P-p_1 = \frac{2t \cos a}{d}.$$

In this case an account of the water above wetting the surface, $a = 0$.

$$\therefore P-p_1 = \frac{2t}{d}.$$

And $(P-p_1)A$ is the supporting force for the water and the disc.

∴ Weight (of water between disc and disc)

$$= (P-p_1)\pi R^2 = \frac{2t\pi R^2}{d}.$$

Or by using Eq. (5).

$$\therefore \frac{2tA \cos a}{d} + Bt \sin a,$$

as $a = 0$; ∴ $\cos a = 1$, and $\sin a = 0$.

$$\therefore \text{ force} = \frac{2tA}{d} = \frac{2t\pi R^2}{d}.$$

Energy of a plane film.—The work which must be expended in drawing out a film represents the energy of the film.

Thus if A and B represents two plates close together, and if we imagine them to be pulled apart by a force F through a distance l, the work done will be $F \times l$.

Hence if t denote the tension per unit length, the work done $= t \times l$.

If S denotes the superficial energy per unit area, then taking unit breadth of film the actual energy is $S \times l \times 1$.

Hence $$t \times l = S \times l.$$

$$\therefore t = S.$$

or the superficial energy per unit of area is equal to the tension per unit of length.

Ex. 7. (*a*) In a plane film show that the superficial energy per unit of area is numerically equal to the tension per unit of length.

(*b*) If the surface tension equals the weight of 1·75 grains per inch, find the superficial energy in foot-poundals per square foot. (Hon., 1897.)

(*b*) Solution :—

Surface tension $= 1{\cdot}75 \times 12$ grains per foot.

Superficial energy in foot-poundals

$$= \frac{1{\cdot}75 \times 12}{7000} \times g$$

$$= \frac{1{\cdot}75 \times 12 \times 32{\cdot}2}{7000} = {\cdot}096.$$

When air is forced into a soap bubble, say by means of a tube, work is done, the intrinsic energy is increased, and an increase in volume and surface takes place. If the open end of the tube be brought near to a lighted candle, a jet of air will be blown into the flame, and the soap bubble will be seen to contract.

If P and p_1 denote the internal and external pressures respectively in a soap bubble of radius r, surface s, and volume v.

Then if p denote the difference between the internal and external pressure, $\therefore p = P-p_1$.

The resultant pressure on any diametral section will be $p \times \pi r^2$, and this is balanced by the tension furnished by a band or ring of unit width, and length $2\pi r$. ∴ $t \times 2\pi r$, where t denotes the tension per unit length.

Hence $$p \times \pi r^2 = t \times 2\pi r.$$

$$\therefore 2t = pr,$$

$$\text{or } t = \frac{pr}{2}. \quad (6)$$

To find the work done in expanding a soap bubble from radius r_1 to radius r_2.

The volume v of a sphere of radius r is $\frac{4}{3}\pi r^3$.

When the radius is increased by an indefinitely small amount indicated by $r + dr$, the volume becomes $v + dv$.

$$\therefore dv = 4\pi r^2 dr.$$

The work done $= p \times dv$.

$$\text{Hence work done} = \int_{r_1}^{r_2} p \times dv, \quad (7)$$

but $p = \frac{2t}{r}$ from Eq. (5).

Also $dv = 4\pi r^2 dr$.

Hence substituting these values in (6), we get

$$\text{Work done} = \int_{r_1}^{r_2} \frac{2t}{r} \times 4\pi r^2 dr$$

$$= 8\pi t \int_{r_1}^{r_2} r\,dr$$

$$= 4\pi t(r_2^2 - r_1^2), \quad (8)$$

or if S denote the surface of the soap bubble, then

$$S = 4\pi r^2.$$

$$t \times S = 4\pi r^2 t,$$

$$\text{and } tdS = 8\pi rt\,.dr,$$

and the summation as before will give the work done.

If r_1 be zero, then Eq. (7) becomes $4\pi t r_2^2$; or *the total work done in the formation of a bubble of radius r is* $4\pi tr^2$. (8)

If in a soap bubble of radius r, p denote the external and P the internal pressures respectively, then

$$P \times \pi r^2 - p\pi r^2 = 2\pi rt.$$

$$\therefore (P-p)\pi r^2 = 2\pi rt.$$

$$\therefore Pr = 2t + pr.$$

$$\therefore P = \frac{2t + pr}{r}. \quad (10)$$

An equation from which the internal pressure can be found when the external pressure p changes to p_1, as in the following example.

Ex. 8. A soap bubble has a certain internal pressure p when the atmospheric pressure is Π ; find an equation for determining the internal pressure when the atmospheric pressure changes to Π^1. (1897.)

Ex. 9. Show that the work done in expanding a soap bubble from radius a to radius b equals $4\pi(b^2 - a^2)t$.

Why is t, the tension of the film, constant? (1894.)

Ex. 10. Find the work done in the expansion of a soap bubble. Find the result in foot-pounds when the diameter of the bubble is increased from 3 inches to 12 inches, having given that the surface tension is 1·12 grains weight per inch. (Hon., 1896.)

Solution, using Eq. (7) :—

$$r_1 = \tfrac{1}{4} \text{ ft.}, \; r_2 = \tfrac{1}{2} \text{ ft.}$$

$$\therefore r_1^2 = \tfrac{1}{16}, \; r_2^2 = \tfrac{1}{4}.$$

$$\text{Tension in pounds per ft. length} = \frac{1{\cdot}12 \times 12}{7000}.$$

$$\therefore \text{Work done} = 4 \times 3{\cdot}1416\left(\frac{1}{4} - \frac{1}{64}\right) \times \frac{1{\cdot}12 \times 12}{7000}$$

$$= {\cdot}00056 \text{ ft.-pd.}$$

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HEAT,

WITH SPECIAL REFERENCE TO ELEMENTARY THERMODYNAMICS.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

It may be useful here to briefly recapitulate the results we have obtained respecting the expansion of gases at constant pressure. The equation to the isothermals of a perfect gas, at an absolute temperature T, may be written

$$pv = RT \quad (1)$$

where R is a constant whose numerical value may be easily calculated in accordance with the principles developed in the first of the present series of papers on Heat. If, now, T be increased by dT, *i.e.*, the absolute temperature becomes T + dT, whilst p is maintained constant, v must be increased by dv. Hence

$$p(v + dv) = R(T + dT). \quad (2)$$

Subtracting (1) from (2), we obtain

$$pdv = RdT. \quad (3)$$

Dividing (3) by (1), we obtain

$$\frac{dv}{v} = \frac{dT}{T}. \quad (4)$$

Now since a volume v of gas is increased by dv when the temperature is raised by dT, unit volume would be increased by $\frac{dv}{v}$.

Hence the quantity $\frac{dv}{v}$ is termed the expansion *per unit volume* of the gas; thus we obtain the result that *the expansion per unit volume of a perfect gas, the pressure remaining constant, is proportional to the increase of temperature, divided by the absolute temperature of the gas.*

The student should here try and make himself as familiar as possible with the difference between the absolute increase in volume of a certain quantity of gas when heated, and the expansion per unit volume of the gas. Since the volume of a certain quantity of gas at constant pressure, as shown previously, is proportional to its absolute temperature, the increase in its volume when heated is proportional to the increase of its temperature. This is expressed by equation (3). This result should be carefully compared with that obtained by interpreting equation (4).

Problem.—A quantity of hydrogen weighing ·1 gr. just fills a receptacle at a temperature of 0°C, and standard atmospheric pressure (76 cm. mercury). What is its volume? By how much will this volume be increased if the gas be heated to 100°C, the pressure remaining constant? What will be the expansion per degree centigrade per unit volume at 0°C and 100°C.

Answer.—1,000 c.c. of hydrogen, at 0°, and standard pressure, weighs 0·0896 grs. Hence ·1 gr. of hydrogen under the above conditions occupies a volume of

$$\frac{1{,}000 \times \cdot 1}{\cdot 0896} \text{ c.c.} = 111{\cdot}6 \text{ c.c.}$$

When heated to 100° C under constant pressure this mass of hydrogen will occupy a volume of $111{\cdot}6 \times \left(1 + \frac{100}{273}\right)$ c.c.

Hence the increase of its volume under these conditions will be

$$\frac{111{\cdot}6 \times 100}{273} = 40{\cdot}9 \text{ c.c. nearly.}$$

The expansion per unit volume per degree centigrade at 0° and 100° will be $\frac{1}{273}$ and $\frac{1}{100 + 273} = \frac{1}{373}$ respectively.

It should be noticed that the expansion per unit volume being given by the quotient of one volume by another, $\left(\frac{dv}{v}\right)$, has no dimensions, and is therefore merely a number. On the other hand the absolute increase in volume of a given quantity of gas when heated obviously has the dimensions of a volume.

Increase of pressure of a gas when heated, the volume being maintained constant.

As before we have the equation to the isothermals of the gas

$$pv = RT \quad (1)$$

If T is increased by dT, v remaining constant, p must become equal to $p + dp$. Hence

$$(p + dp)v = R(T + dT)$$
$$\therefore vdp = RdT. \quad (5)$$

Dividing (5) by (1), we obtain

$$\frac{dp}{p} = \frac{dT}{T} \quad (6)$$

The quantity $\frac{dp}{p}$, when dT = 1°C is often called the expansion of the gas at constant volume—an obviously unsuitable designation. A better term would be the increase of pressure, per unit pressure, per degree centigrade at constant volume. The chief thing to notice is that it has no dimensions, except those of temperature, agreeing in value with the expansion of a gas per unit volume per degree centigrade under constant pressure.

The Air Thermometer.—Atmospheric air at ordinary temperature differs so little in its properties from those of a perfect gas that it can conveniently be used for effecting accurate thermometric measurements. The mercury in an ordinary thermometer expands at a rate not very far removed from the rate of expansion of the glass envelope; consequently a large number of corrections have to be applied. Further, mercury cannot be used for measuring very high or very low temperatures. An air, or better still, a hydrogen or helium thermometer, therefore, forms the best standard; actual measurements of temperature are most conveniently made by measuring the electrical resistance of a platinum wire, previously calibrated by the aid of one of the previously mentioned gas thermometers.

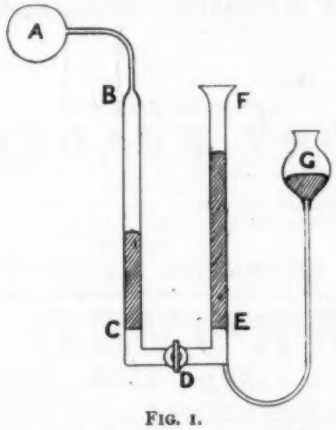

FIG. 1.

Fig. 1 represents a simple form of air thermometer intended to illustrate the general method of determining the expansion of air, as performed by Regnault. A is a bulb connected by means of a tube with the end B of a graduated glass tube BC. The end C of this tube fits into a cast-iron tube CE with a three-way stopcock at D. A second graduated glass tube FE open to the atmosphere at F, is joined to this iron tube at E, whilst mercury can be introduced into BC and FE from a reservoir G by means of a piece of pressure tubing GE.

Let us suppose that A has been filled with dry air, and mercury has been introduced into BC and EF. The following experiments will illustrate the method of procedure:—

(1) *To find the volume of A.*—Adjust the level of G till the mercury stands at the same level in both FE and BC. The air contained in A will now be subjected to atmospheric pressure. Call this pressure (supposed to be measured in centimetres of mercury) P, and let the volume of A + the connecting tube and that part of BC above the mercury surface = V. Then

$$PV = \text{constant.}$$

Now lower the reservoir G. The mercury will fall in both BC and FE, but will stand higher in the former than in the latter. Let the difference in level = p cms. Also, let the volume of that part of the tube BC which has just been emptied of mercury = v. Then

$$(P - p)(V + v) = PV = \text{constant.}$$
$$\therefore Pv - pV - pv = 0.$$
$$V = \frac{(P - p)v}{p}.$$

Hence the required volume of A can be obtained by subtracting the volume of the tube BC initially occupied by air, from V. The connecting tube between A and B is supposed to have a volume negligible in comparison with that of A.

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(2) *To determine the expansion of air, the pressure remaining constant.*—The bulb A, after being filled with dry air, is surrounded by snow or ice shavings. The air within the bulb will soon reach the temperature of melting ice, *i.e.*, 0°C. G is adjusted till the mercury in BC is on a level with that in FE. A is now placed in a steam jacket, and left till it has assumed a constant temperature. This will be 100° C. if the barometric pressure is equivalent to 76 cm. of mercury. Owing to the expansion of the air the mercury surface in BC will have been forced downwards. In order to restore the pressure to its initial value, G is lowered till the mercury surfaces in BC and EF are again level. The volume V_1 of that part of BC now occupied by air, which was formerly occupied by mercury, gives the expansion of the air in A.

(Of course for accurate measurements the air column in BC should also be surrounded by steam during the latter experiment, and by ice during the former. It is this that renders the expansion of air at constant pressure a difficult constant to determine.)

To calculate the coefficient of expansion of air at constant pressure, let the equation to the isothermal of air at a temperature t be written

$$pv = K(1 + at)$$

For 0° C. this equation becomes

$$pV = K,$$

For 100°, $p(V + v_1) = K(1 + a \times 100)$,

$$\therefore pv_1 = 100\,Ka,$$

$$\therefore \frac{v_1}{V} = 100\,a$$

$$a = \frac{v_1}{100V}$$

Another way of performing this experiment is as follows:—

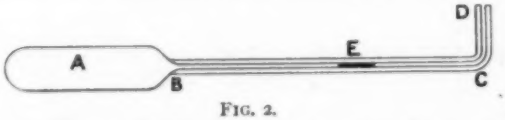

FIG. 2.

A tube A (fig. 2) is sealed on to a long piece of thermometer tubing BC, the volume per cm. length of the latter having formerly been carefully determined by measuring at various points the length of a thread of mercury inside it, and finally weighing the mercury on a watch glass. Weigh ABCD on a balance. A can now be filled with water by alternate heating and cooling, the bent end D of the thermometer tube being kept under water. When filled let the whole cool down to the temperature of the room. Again weigh. The mass of the contained water at a known temperature being determined, the volume occupied by that water may be found from a table of the densities of water at various temperatures. The water is now expelled by heating, and the bulb and thermometer tube are dried by alternately exhausting and filling with warm dry air. Finally the bulb A being slightly warmed, the end D of the thermometer tube is placed below the surface of some clean mercury, and a short thread E sucked into the tube by cooling. This thread acts as a piston, enclosing a certain quantity of air in A. The whole is now placed in melting ice, and the position of E noted. The position of E when the whole is placed in steam being found, the volume of that part of the tube BC between these two points gives v_1 in the above formula. V will of course be the volume of A and that part of BC to the left of the thread of mercury when the whole was in melting ice.

This experiment looks much better on paper than when actually performed. It appears that the thread of mercury does not act as an air-tight piston, but allows a small amount of air to pass it. Further the mercury sticks to the walls of the tube, and even constant tapping does not make it acquire its proper position. Consequently the coefficient of expansion of air at constant pressure when determined by this apparatus is not very accurate.

(*To be continued.*)

Acids from Sawdust.—One of the latest enterprises in Norway is the dry distillation of acetic acid, wood naphtha, and tar from sawdust. A factory has been started at Fredrikstadt which is capable of distilling 10,000 tons of sawdust during the year, and also of manufacturing charcoal briquettes, which are exported to the Netherlands. This is the first factory of the kind erected in that country. The acids are sent mostly to Germany, while the tar is consumed at home.

PHYSIOGRAPHY NOTES.

Constant of Aberration.—Professor C. L. Doolittle, from observations made at the Flower Observatory of the University of Pennsylvania, states that employing Kustner's method he obtains a result of $20''{\cdot}572 \pm 0''{\cdot}009$, which is even larger than his recent deduction of $20''{\cdot}55$.

Since the adoption of $20''{\cdot}47$ at the Paris Conference, the four most important deductions give higher values, viz.: $20''{\cdot}55$ (Doolittle), $20''{\cdot}553$ (Fergola), $20''{\cdot}57$ (Finlay), and $20''{\cdot}572$ (Doolittle).

A Magnetic Storm.—In his Daily Weather Report for March 16th, Mr. Chas. Chree, of the Kew Observatory, gives an interesting account of a magnetic storm that took place on **March 15.** 'Since August 1894 no magnetic storm has occurred in England at all equal to one experienced during the last few days. Its **first indication** at Kew Observatory occurred about **8.55 p.m. on the 14th March,** when a noticeable increase took place in the horizontal force. This element then oscillated about its normal value to a moderate extent until 4 p.m. on the 15th, when there commenced a large decrease superimposed on large oscillatory motions. The minimum was reached about 10.48 p.m. on the 15th. During the subsequent rise, which was very rapid at first, there were some further large oscillations, and the element remained somewhat disturbed until 5 p.m. on the 16th. The vertical force was only slightly disturbed until 2 p.m. on the 15th. After increasing to a maximum, about 5 p.m., it decreased rapidly with large oscillations, attaining a minimum about 10.48 p.m. It then approached its normal value, the oscillations being large at first, but becoming small early in the morning of the 16th.

The declination disturbance commenced at the same time as that of the horizontal force, but was small until midnight on the 14th. After a general easterly movement, lasting for some hours, the needle reversed its direction, attaining its extreme westerly position about 2.48 p.m. on the 15th. It then recommenced a very conspicuous movement to the east, with various large oscillations. After attaining an extreme easterly position, about 11.18 p.m. on the 15th, the needle moved once more to the west, the motion remaining oscillatory. The disturbance did not disappear until 8 p.m. on the 16th.

The extreme amplitude of the disturbance was: horizontal force, ·0050 C.G.S. units; vertical force, ·0057 C.G.S. units; declination, 1° 26′. In 8 minutes, from 10.40 to 10.48 p.m. on the 15th, the horizontal and vertical components exhibited falls of ·002 and ·003 C.G.S. units respectively. The most rapid change of declination occurred some 30 minutes later. Speaking generally, the most salient features were **the large falls in both the vertical and horizontal components,** and the **movement of the declination needle to nearly 1° east of its normal position.** The storm was presumably associated with the **brilliant aurora** visible on the night of the 15th in the northern half of the kingdom and in Denmark.

The Syllabus for Elementary Physiography.—The following letter from a teacher of Physiography will be of interest:—

'One would have thought that before putting the directions for an experiment in the Syllabus, every care would have been taken to verify them. Yet in No. 141, page 14, of Physiography Syllabus, we find the following:—

"Take two small (say one inch square) pieces of sensitive albumenised paper side by side, and place one with its sensitive surface vertical and the other inclined at an angle to the vertical. At a position of, say, a foot off, burn two inches of magnesium ribbon so that the light falls normally on the vertical piece of paper. This paper will be more blackened than the other, showing that light acts most energetically when a surface is at right angles to the direction of the rays. The sun is on an average much higher in the heavens in summer than in winter; hence the light has more power to heat the earth on that account."

'Now the ordinary sensitive paper is not affected in the least degree to the ordinary eye by such an exposure, and even with bromide paper hardly any change is apparent. I have found, however, that if a piece of bromide paper is dipped in a solution of potassium nitrite and at once exposed as above, the difference in the "darkening" is quite apparent. But the word "blackened," as used in the Syllabus, does not convey the right meaning; and albumenised paper is not nearly "fast" enough to give any result while two inches of magnesium ribbon is being burnt.'

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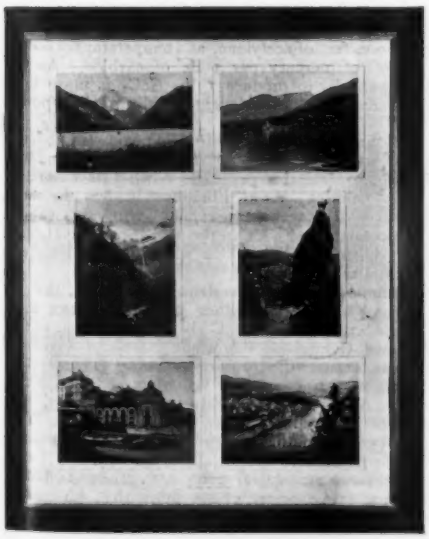

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CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
First Class Honoursman in Chemistry (Science and Art Department), Head Master, Finchley Organised Science School, and Lecturer therein on Chemistry.

Liquid Air by the Gallon.—Dr. Morton contributes to the *Chemical News* a very interesting experiment with liquid air on a large scale. The liquid air (about two gallons in quantity) was brought from the works at 121 to 89th Street, New York City, very much as a can of milk might have been transported ; *i.e.*, the liquid air was in a zinc can placed in a wooden bucket, such as is used in transporting ice cream, the space between the can and the bucket being filled with ordinary hair felt, such as is used in covering steam pipes. From this tin can the air was dipped out as required with a tin ladle, exactly as milk would be served from an ordinary milk-can.

The condition of the liquid air is in fact this : When produced it is of necessity intensely cold, because its critical temperature being about — 189° F., no amount of pressure will liquefy it unless it is at least as cold as this.

When the pressure is relieved by drawing off the liquid into an open vessel, a portion at once vaporises, but in so doing cools the rest to a still lower temperature ; and when so cold as this the tendency to vaporise is very moderate, so that, if the liquid is placed in a vessel with non-conducting walls (like the tin can packed with felt in a wooden pail), it will only evaporate slowly, so that a quantity may be kept in this way for six or eight hours with only a trifling loss.

Amongst the interesting experiments performed on this occasion were the following :—

Liquid air was dipped out of the can, and poured on some mercury, which was promptly frozen, so that it could be shaped by hammering exactly as a block of lead could be.

A piece of soft rubber tubing, dipped for a moment in the liquid air, became as brittle as glass, and was shattered into splinter-like fragments when struck by a hammer.

Wrought iron cooled in like manner by liquid air, became so fragile, that it was snapped with ease between the fingers, but copper and aluminium lost none of their flexibility.

An egg or a piece of meat frozen by this intense cold crumbled in the hand like a piece of dry bread.

A mass of cotton or of hair felt soaked with liquid air, and lit with a match, burned violently, like meal gunpowder, or like the pyrotechnic mixtures used in many fireworks.

Poured between the poles of a powerful magnet, the liquid air clung to the poles, as would iron filings, and presently formed a bridge across the space between the poles. This was due to the magnetic properties of the oxygen.

A tea-kettle filled with liquid air boiled, giving off clouds of apparent steam without being heated, and was even made to boil more violently by the application of ice, for the reason that ice compared with liquid air is a very hot substance indeed. The appearance of steam was due to the condensation of the moisture in the atmosphere by the intense cold of the gaseous air into which the liquid air was changing.

Liquid Air by Dr. Carl Linde's Method.—The method is a regenerative one, for the cold produced by the treatment of the portion of air is communicated to that which is coming on to be treated. In Linde's apparatus the drop in temperature is produced by letting compressed air escape through a small orifice from a region of high pressure to one of lower. The air is slightly cooled by expansion, the fall in temperature being however only a quarter of a degree for each difference of one atmosphere in pressure between the two sides of the orifice ; but this small amount is sufficient to furnish the step down in a regenerative process. The gas cooled slightly in passing through the orifice gives up its cold to gas which is approaching the orifice. The passage through the orifice cools the gas further, and so on, with the result that a cumulative cooling proceeds. A temperature of — 200° C. or lower may thus be obtained without any difficulty.

Ammonium Peroxide.—If an ethereal solution of H_2O_2 is added to a large excess of an ethereal solution of ammonia, the substances being cooled with $CaCl_2$ and snow, a solid compact crystalline substance is obtained. The crystals, after washing with cold ether, were dried on a tile, and analysed. They appeared to correspond to the formula $(NH_4)_2O_2 + H_2O_2 + H_2O$. At ordinary temperatures the substance decomposed, first dissociating into NH_3 and H_2O_2, and then giving off oxygen energetically, and forming a small quantity of ammonium nitrate.

Labels for Reagent Bottles.—Mr. H. Jervis says that of all the varnishes, balsams, etc., used to coat the surface of labels, paraffin wax is about the most handy and serviceable. Faraday recommended a mixture of Brunswick black with half its bulk of oil of turpentine : the mixture to be kept in a bottle whose stopper was perforated with a thick nibbed pen. A more tasty label of a similar sort may be made by grinding sealing wax, first dry, and then mixed with a little alcohol and ether in such proportion as to make a thick liquid. Such liquid is best applied to the bottle with a small stiff brush. If the bottle can be warmed, it is feasible to write on the heated surface with the pointed end of a piece of sealing wax. Such labels never get disfigured.

Formation of the Perchlorates of the Alkalis and Alkaline Earths by Electrolysis.—To the *Chemiker Zeitung* Herr Winteler makes the following communication: 'By using platinum or peroxide electrodes, aqueous solutions of the chlorides of the alkalis and alkaline earths can be electrolysed, hypochlorites and chlorates being formed. Under certain circumstances the perchlorates can be formed also. When the electrolysis has proceeded so far that only chlorate is found in the solution, this chlorate will oxidise further between platinum or peroxide electrodes under the following conditions: —(1) When there is an acid solution round the anode ; (2) when the anode is at a low temperature ; (3) when there is a current density of from 4 to 12 ampères ; (4) when the concentration of the electrolyte is as great as possible. Suppose, for example, at ordinary temperature, saturated solution of $KClO_3$ is electrolysed without using a diaphragm, the electrodes being kept at 16°, 75 per cent. of the oxygen, which ought to separate out, is used to convert the chlorate to perchlorate. A saturated NaClO solution (1 : 1), under exactly similar circumstances, is transformed into perchlorate, with a yield of 95 per cent. When nearly the whole of the chlorate is transformed, the yield begins to decline very rapidly. An intense smell of **ozone** is characteristic of the formation of perchlorate. Ozone is evolved in such quantities from a concentrated chlorate and perchlorate solution that rubber tubing and connections will be destroyed in a few minutes, and it would be worth while to use this electro-chemical method for preparing ozone. . . .' An interesting observation, which has been lost sight of recently, is that of A. Riche, by which **dilute HCl is turned into $HClO_4$** by electrolysis between platinum electrodes.

Calcium Carbide and Acetylene (H. Fowler).—Acetylene was first isolated by E. Davy in 1837 from potassium carbide, by a product of Sir H. Davy's method of manufacturing K. During the past few years it has assumed commercial importance owing to the development of the electric furnace, in which CaC_2 can be produced from **lime and carbon**. The furnaces used consist essentially of crucibles with carbon rods forming the positive electrode and a bottom plate line with carbon for the negative. In the more recent furnaces these crucibles are mounted on small trollies so that they may be run out of the furnace when ready and a fresh one inserted without loss of time. The carbide formed is a hard, dense substance of reddish colour, unacted upon by most of the ordinary reagents. It is, however, **rapidly decomposed by water into acetylene and lime,** giving 5·9 c. feet of acetylene, at a temperature of 60° F. and a pressure of 30″ of mercury per 1 lb. of carbide. As the power required theoretically to produce 1 lb. CaC_2 is more than 2 H.P. hours, its manufacture is restricted to localities where power is cheap.

Acetylene is a colourless gas with an intensely penetrating odour, slightly soluble in water, extremely so in other liquids. It is **endothermic**, giving 407 calories per c. foot, whereas theoretically its value is 336·5 calories. As an illuminant it gives the most brilliant light of all gases, 5 c. ft. per hour giving 240 candle power. Acetylene combines with Cu in the presence of NH_3 and moisture, forming copper acetylide which when dry is highly explosive. Silver is similarly acted upon.

Nearly all proportions of air and acetylene are explosive, the gas being decomposed at 780° C. **At higher pressures than two atmospheres**, if this temperature (780° C.) is attained by part of the gas it is communicated throughout the whole mass and a violent explosion occurs, which causes the pressure to rise to 11 times the initial pressure ; but owing to cooling by radiation, etc., this is not reached in practice. Acetylene can readily be liquefied, having a critical temperature of 37° C. and pressure of 18 atmospheres. The resulting liquid is very light and has a high coefficient of expansion. It easily and violently explodes. With CaC_2 at £16 per ton it can compete with coal gas at 2s. 6d. per 1000 c. ft. when flat flames are used and an illuminative power of not more than 30 candle power is required.

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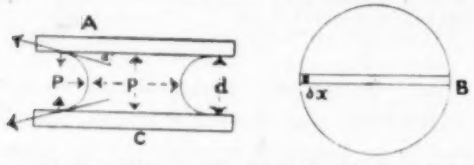
$$\frac{2Al\cos\alpha}{d} + Bl\sin\alpha,$$

A being the area of the film and B its periphery.



Let A and C be the two plates supposed to be at a small distance d apart (exaggerated in the diagram).

Let P denote the external pressure, which is the atmospheric pressure, and p the internal pressure on the film.

Adopting the usual notation,

$$(P - p)\, d.\delta x = 2l.\cos\alpha.\delta x.$$

$$\therefore P - p = \frac{2l\cos\alpha}{d} \quad (1)$$

Neglecting the action of gravity, which is unimportant compared with the tension of the film, let F denote the force tending to pull the plates together, due to the surface tension,

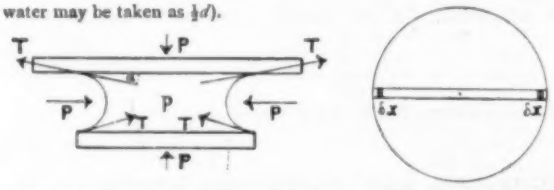
$$\text{then } F = \int_0^B l\sin\alpha.\delta x. = Bl\sin\alpha. \quad (2)$$

$$\text{The total force} = (P - p)A + Bl\sin\alpha, \quad (3)$$

or substituting the value of $(P - p)$ from (1) in equation (3),

$$\therefore \text{Total force} = \frac{2l.A\cos\alpha}{d} + Bl\sin\alpha.$$

2. A horizontal disc of glass is held up by means of a film of water between it and a similar disc of the same or larger size above it. If R denote the radius of the lower disc, d the distance between the discs, which is small compared with R, T the surface tension of water; show that the weight of the lower disc, together with that of the water between the discs, is approximately equal to $\frac{2T\pi R^2}{d}$ (the radius of the curvature of the concavity of the water may be taken as $\frac{1}{2}d$).



Let P denote the pressure outside the film (the pressure of the atmosphere)

p = internal pressure.

Then $(P - p)\, d \times \delta x = 2T\cos\alpha.\delta x.$

$$\therefore P - p = \frac{2T\cos\alpha}{d}. \quad (1)$$

In the case of water against a surface well wetted with that liquid

$$\alpha = 0.$$

And $\therefore$ Equation (1) becomes

$$P - p = \frac{2T}{d}.$$

But the difference of pressures $P - p$ is the supporting force for the weight of the enclosed water and the disc.

$\therefore$ Weight (of disc and water between the discs)

$$= (P - p)\,\pi R^2$$

$$= \frac{2T\pi R^2}{d}.$$

Science.—For Honours Hygiene, Part I., read Parke's 'Hygiene' (Lewis & Co.), Notter's 'Hygiene' (Longmans), and three small books by Clarke, High Road, Leyton, on 'Sanitary Law,' 'Trade Nuisances,' and 'Drain Inspection.'

Integer.—A flexible chain of uniform density *lies coiled* up on the edge of a table whose height exceeds length of chain. One end of the chain falls, find (1) the acceleration of the velocity when a given length is hanging, (2) the velocity at that instant, (3) *the work done*, and (4) the time taken for the given length to run out.

Is any work done against the work done by gravity, if so what is it?

How would these results be affected by supposing the density of the chain to vary directly as its distance from the falling end?

Let m denote the weight of the chain in poundals per linear foot, x the given length, moving with velocity v, at time t.

(1) The momentum of chain at time t, when x feet is over the edge of the table, is mxv.

The acting force is the rate of change of momentum per second $= mv^2 + mxf$. (Where f denotes the acceleration.)

But the acting force is the weight of the chain;

$$\therefore mxg = mv^2 + mxf;$$

$$\therefore f = g - \frac{v^2}{x} \quad . \quad . \quad . \quad . \quad . \quad (1)$$

In the case of a constant acceleration F, the space described from rest in acquiring a velocity v would be given by $v^2 = 2Fx$.

Hence $\frac{v^2}{x}$ would be constant, *i.e.*, equal to 2F; this will just fit (1).

$$\therefore F = g - 2F,$$

or

$$3F = g;$$

$$\therefore F = \frac{g}{3}.$$

Hence

$$v^2 = \frac{2g}{3}x \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The work done by gravity on the system = kinetic energy acquired

$$= \tfrac{1}{2}(mx)v^2$$

$$= \frac{mg}{3}x^2 \text{ foot poundals.} \quad (3)$$

The time required is given by

$$l = \tfrac{1}{2}Ft^2,$$

or

$$t^2 = \frac{2l}{g} \times 3$$

$$= \frac{6l}{g};$$

$$\therefore t = \sqrt{\frac{6l}{g}} \quad . \quad . \quad . \quad . \quad . \quad (4)$$

If the density of the chain be supposed to vary directly as its distance from the end. Let the density of the chain at a distance x from the falling end be $\frac{m \times x}{h}$.

The mass of a thin section of the chain of thickness δx at this point will be $\frac{mx}{h}\delta x$.

Let b denote the length of the base of a triangle, and h the altitude; the area of an indefinitely thin strip of thickness δx, and width y, would be $y\delta x$; but if x denote the distance of the strip from the vertex, then $\frac{y}{b} = \frac{x}{h}$; $\therefore y = \frac{bx}{h}$.

Hence area of strip $= \frac{bx}{h}\delta x$.

The problem of finding the mass of any length x of the chain is similar to that of finding the area of the smaller triangle cut off from the larger one by a line parallel to the base, and at a distance x from the vertex. The area is $\frac{y \times x}{2} = \frac{1}{2}\frac{bx^2}{h}$.

Therefore the mass of a length x of the chain measured from the lower end is $\frac{1}{2}m\frac{x^2}{h}$.

Having obtained the mass, the preceding equations are easily adapted. See Garnet's 'Elementary Dynamics.'

External Student.—For Advanced Physiography use Gregory (Nelson & Sons); for Agriculture, Prof. Wrightson's book, published by Chapman and Hall; for Hygiene, Newsholme (Geo. Gill and Sons); First Stage Mathematics (Longmans). The suitability or otherwise of the subjects depends upon your own particular inclinations, but a knowledge of Chemistry should precede a study of Agriculture, just as a knowledge of Physiology and of Chemistry is necessary to the intelligent study of Hygiene. To sit as an external student you must apply to the District Secretary. If you do not know who he is write to the Science and Art Department, South Kensington, for his address.

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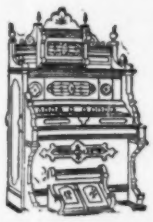

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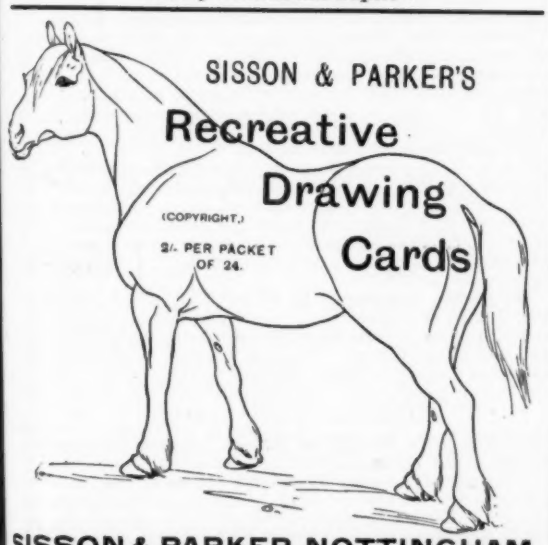

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Object Teaching for the Standards. Standards I. to III. By W. Taylor. This is a very comprehensive manual containing nearly one hundred and fifty lessons in the form of full notes. In fact the information is so full that it would probably be found advisable in practice to subdivide many of the lessons. Those for each standard are arranged in three groups, one dealing with animal life, another with plants and trees, and a third with Common Objects and Properties of Bodies. In several cases a series of lessons treats of allied subjects in natural sequence; thus in Standard III. we find a number of lessons on The House Fly, the Bee, the Spider, the Butterfly, etc.

The volume contains an interesting introduction which gives a brief history of object teaching and its pioneers, a statement of its aims and principles, with useful remarks on schemes of lessons, preparation, method, and modes of illustration. It has also four plates of coloured illustrations on a dark ground, and more than one hundred sketches in white on black, suitable for reproduction on the black-board.

The whole work is likely to prove a valuable help, especially to young teachers.

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The Application of Psychology to the Science of Education. Translated by Miss Mulliner, with a Preface by Miss Dorothea Beale.

Early in this century, a wave of Pestalozzianism swept over Europe. It reached the shores of England, and according to some rumours, it worked considerable mischief.

Later, a wave of Froebelianism, 'big with blessings,' broke over us. But the blessings it brought were not unmixed with evil. Systems, methods, and ideas always suffer in the hands of the ignorant and the unintelligent and the dishonest, and there are always restless teachers going about like the people of Athens, anxious 'either to tell or to hear some new thing.'

A third wave is on our horizon, which has already swept over Germany and America. It is called Herbartianism. It will bring fresh hope to many teachers, but in the hands of the charlatan it will also bring discredit.

Teachers who wish to be prepared for the new wave must study the writings of Herbart, and Miss Mulliner's book affords English readers another opportunity of seeing what Herbart says himself on things educational.

The book consists of thirty-five letters written by Herbart to his friend Friedrich Griepenkerl.

In these letters Herbart deals chiefly with the individual capacity of young people. He discusses 'Innate Differences' and 'Acquired Differences.'

Miss Beale, in the preface, states at the outset that educational thinkers owe to Herbart clear views on the doctrine of apperception, and a clear enunciation of the unity of the mind as opposed to the old doctrine that it consists of many faculties. She says we find in Herbart

> 'the intellectual subtlety of Kant combined with the enthusiasm of Fichte, and giving form to the practical philanthropy of Pestalozzi.'

She shows that the old prejudice

> 'which declared there was no such thing as a science and philosophy of education speaks no longer with so loud a voice,'

and that our psychologists and philosophers, like Ward, Sully, and Laurie, are beginning to turn their attention to questions which affect the child and its training.

Miss Mulliner, in the Chart which she calls Herbart's environment, shows us

> 'the atmosphere of tumult and restlessness which surrounded the young philosopher.'

In his schoolboy days he was startled by the thunders of the French Revolution. Napoleon became Consul while Herbart was studying philosophy, and during his early days as professor at Göttingen Napoleon gained the battle of Jena. Fichte the 'firebrand of German patriotism,' was the master whom the young Herbart revered in his student days at Jena. Froebel was taken from his work in education to fight against Napoleon in the campaign of 1813, while the great-hearted Pestalozzi, who inspired both Froebel and Herbart, was still struggling against social misery in Switzerland.]

Kant's works had revolutionized the world of philosophy, and Rousseau lived in his Emile, which book influenced all educational thinkers.

In her introduction, Miss Mulliner emphasises Herbart's suggestiveness.

> 'He never meant to bind men by hard and fast rules . . Rather, like Socrates, he would suggest new paths for us to try.'

She discusses Herbart's ethical views and his educational aim.

> 'The one problem, the whole problem of education may be comprised in a single concept—morality.'

In discussing the Means of Education Miss Mulliner touches upon Herbart's Metaphysics and Psychology. She shows the part played by Government, Instruction and Discipline in the training of a human being, and she discusses Herbart's doctrine of interest. In attempting to show that there is a real analogy between the development of the race and the child, she gives some interesting examples of hieroglyphics. She discusses concentration and the five formal steps, and she draws up an English literature lesson from Spenser's 'Faerie Queene' to illustrate the teaching method of the latter.

The introduction is perhaps too long. It contains too many quotations and references, which sometimes obscure the thought, but the careful reader will find in it the chief doctrines of Herbartian pedagogics.

Herbart's letters are well translated; the style is clear and lucid. One does not feel, in reading them, as though one were looking for crystals in turgid waters. German pedagogical writings are full of involved constructions, unusual expressions, and psychological terms of peculiar difficulty. Translators frequently get befogged, and their English becomes heavy and obscure. Miss Mulliner has managed to steer clear of difficulties, and has preserved a clear English style throughout.

In the introductory letters Herbart emphasises the necessity of home training in the family circle. He condemns Fichte's golden dream of State Education, in which the pupils were to be severed from adult life and to form 'a separate independent commonwealth.' He points out that 'evil barbaric tendencies' must arise among boys shut off from adult influences. Among the evils of the teaching in public schools, he mentions that

> 'children of mediocre brains go on for a long time mechanically with what is required of them . . . . but they do not know how to use the knowledge they have gained, and lose it as soon as possible.'

He discusses the individual peculiarities of children. He says,

> 'the inborn is a heirloom; the habits acquired in earliest years are a dowry.'

Among the innate differences he considers

Physiological,
Psycho-Physiological,
Psychological.

These occupy the main bulk of his letters. He discusses acquired differences in the last five letters. It is interesting to note the importance he attaches to the observation of children in their early years. At that period he says the

> 'rule of determined egotism has not established itself. At this time they practise the least concealment; their speech and actions are the immediate expression of their fancies. If impartial and accurate observations of that early age were passed on to the tutor of later years, we should then see more easily and more certainly what was to be expected from the pupil's disposition and activity.'

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I was rather amused that you should thank me for my continued patronage, seeing that in sending to you I only serve myself. You always give honest value for money, and you may rest assured that when I can afford to purchase I shall always come to you first, and when I require anything altered or repaired it will always be forwarded to your house.

I shall be pleased at any time to show anyone anything which I have purchased from you, or to recommend your house if needful.

Please make any use you please of this letter. Faithfully yours,
EUGENIE THOMPSON,
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Yours truly,
CLARA TATE.

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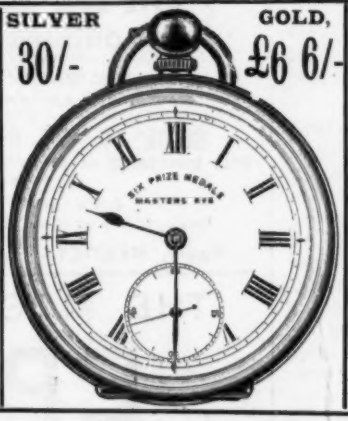

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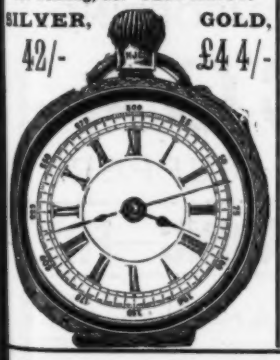

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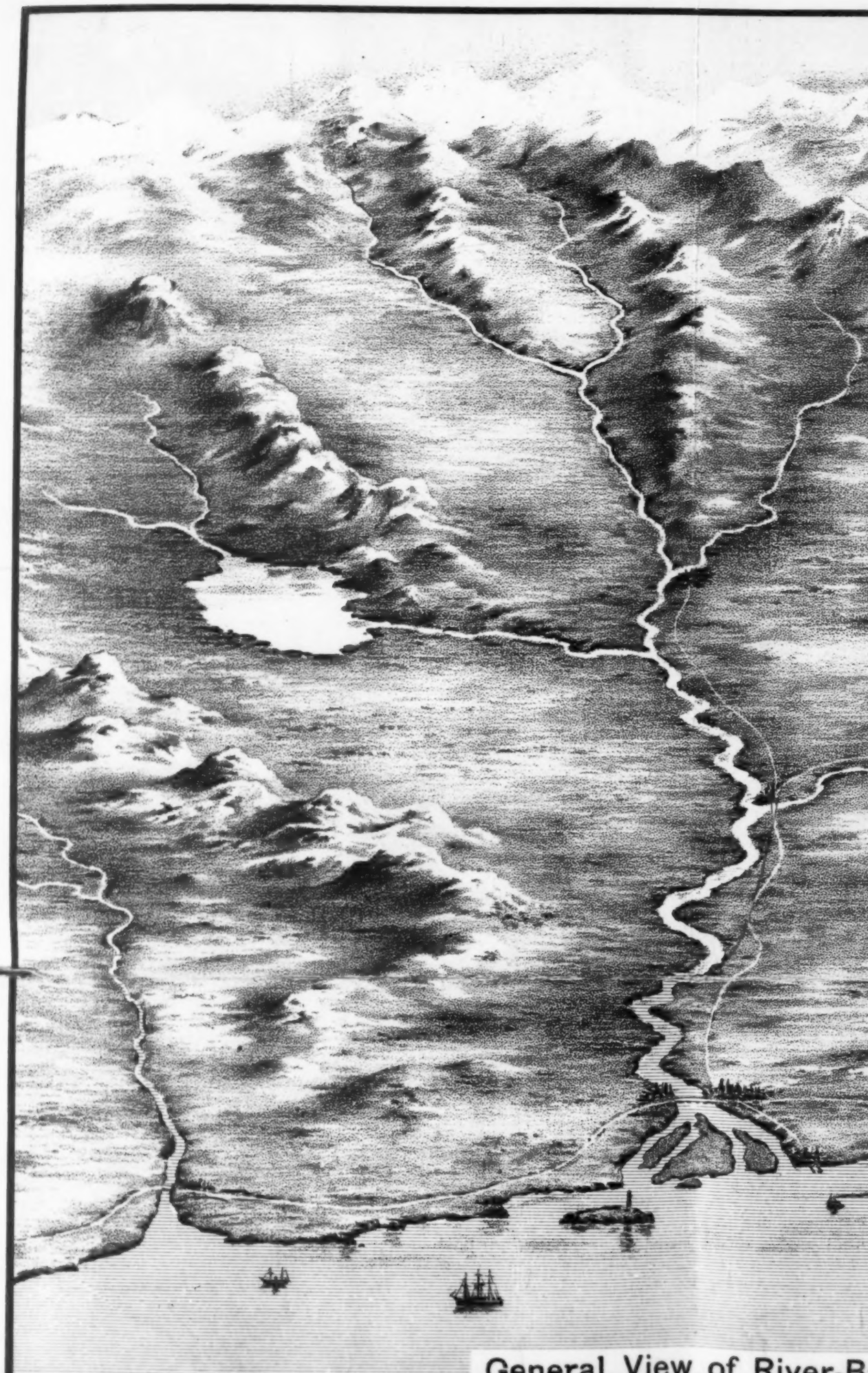

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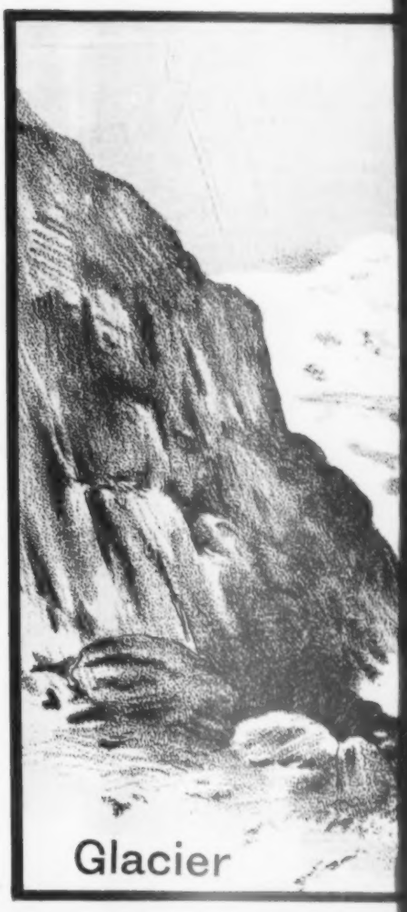

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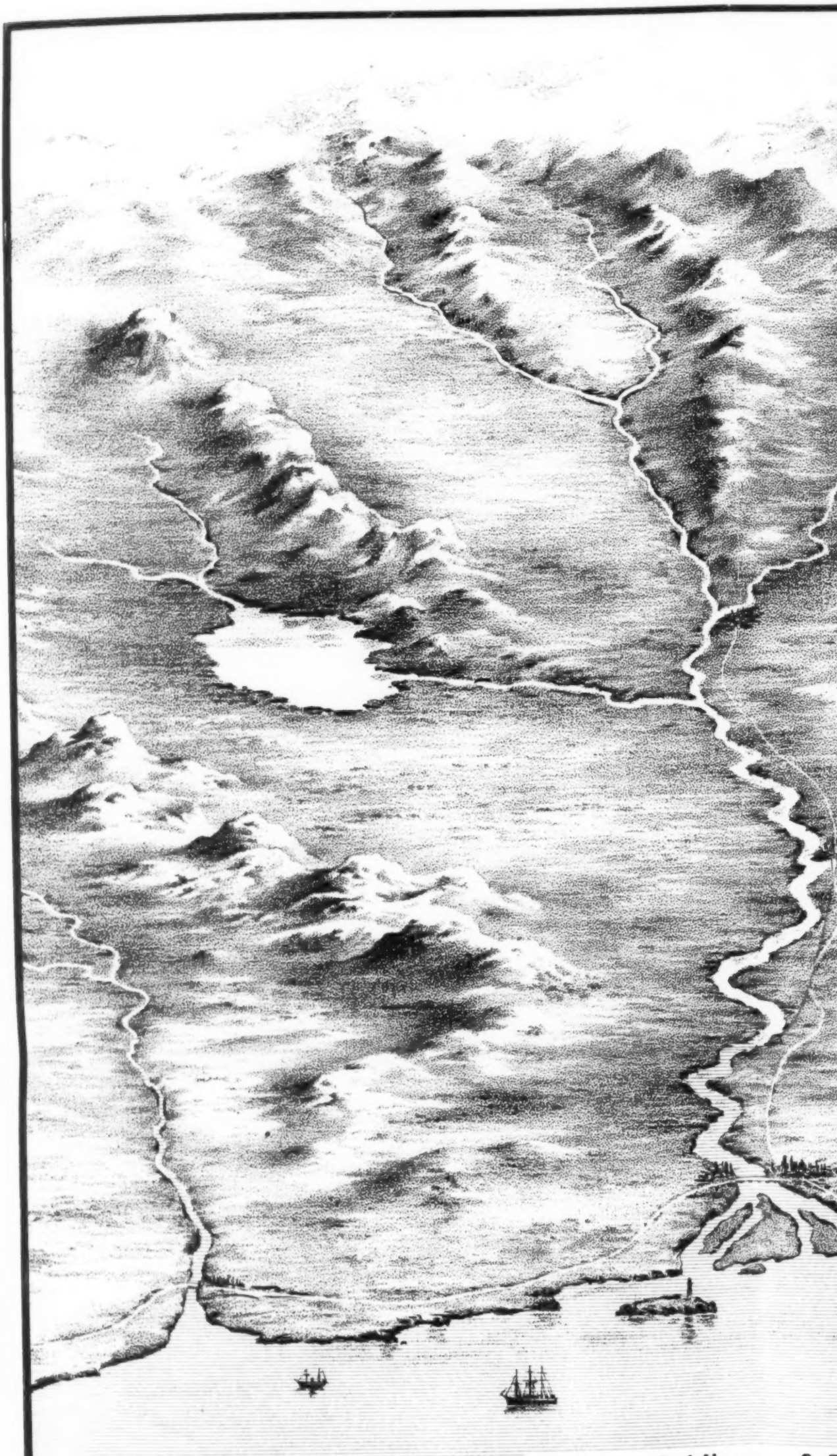

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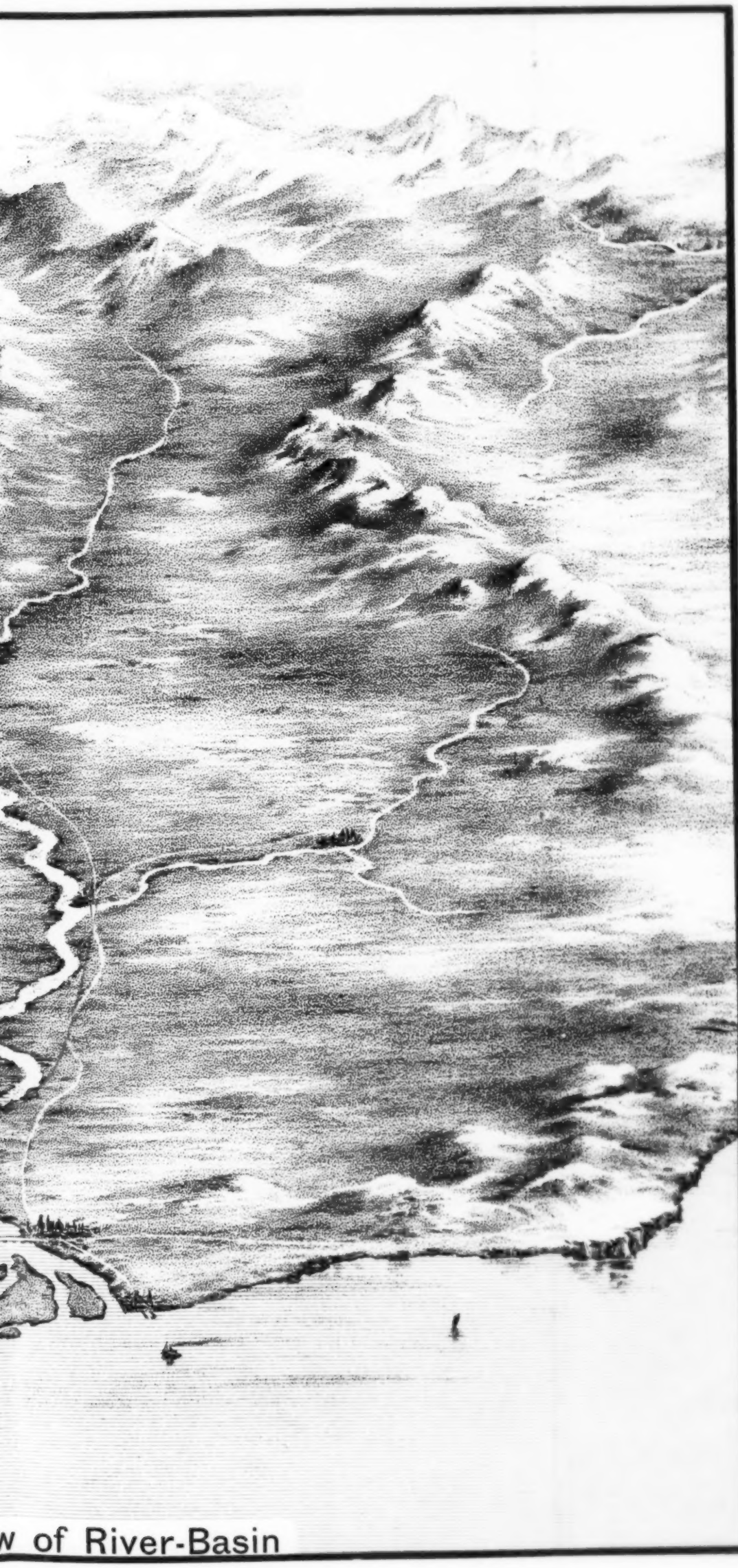

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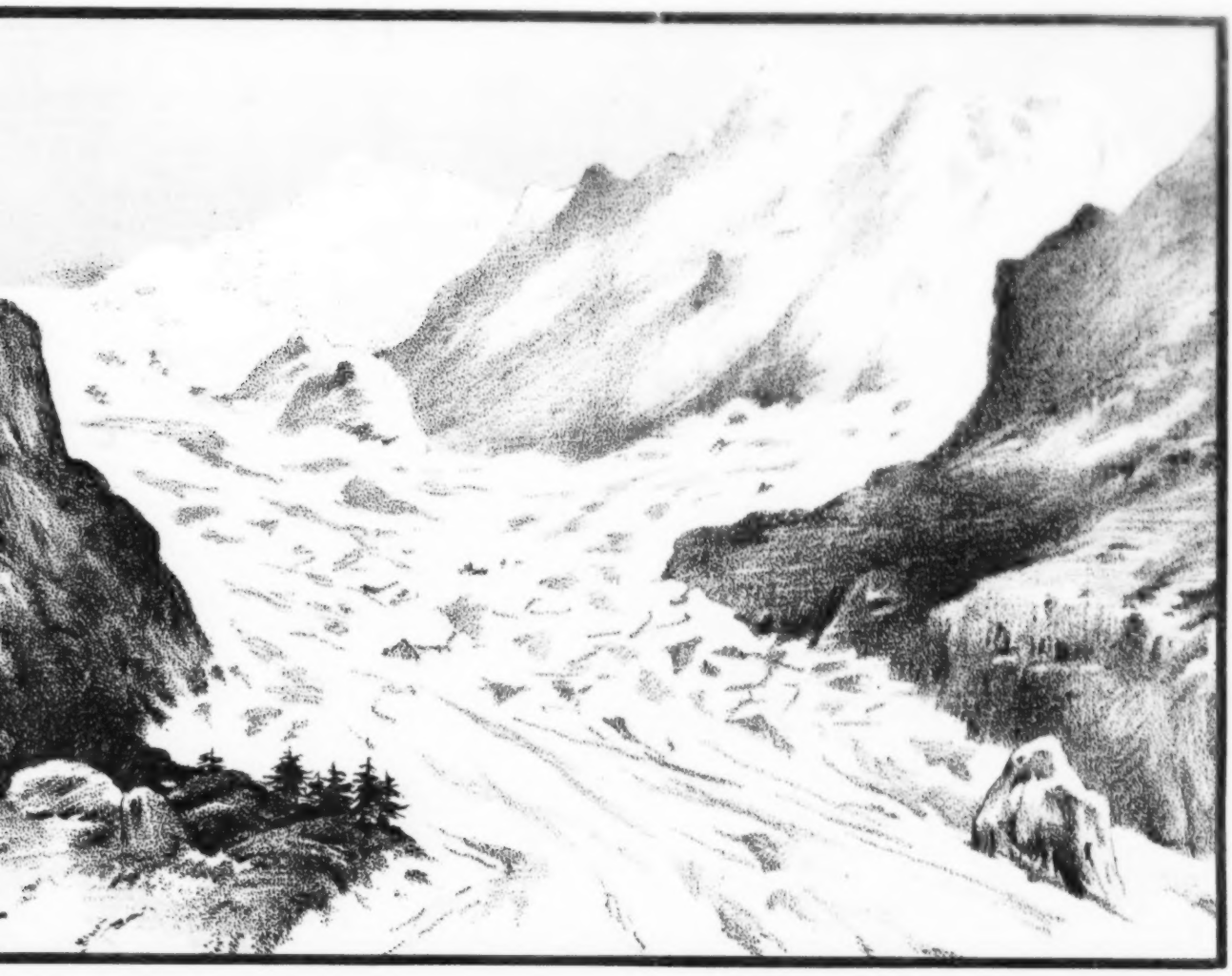

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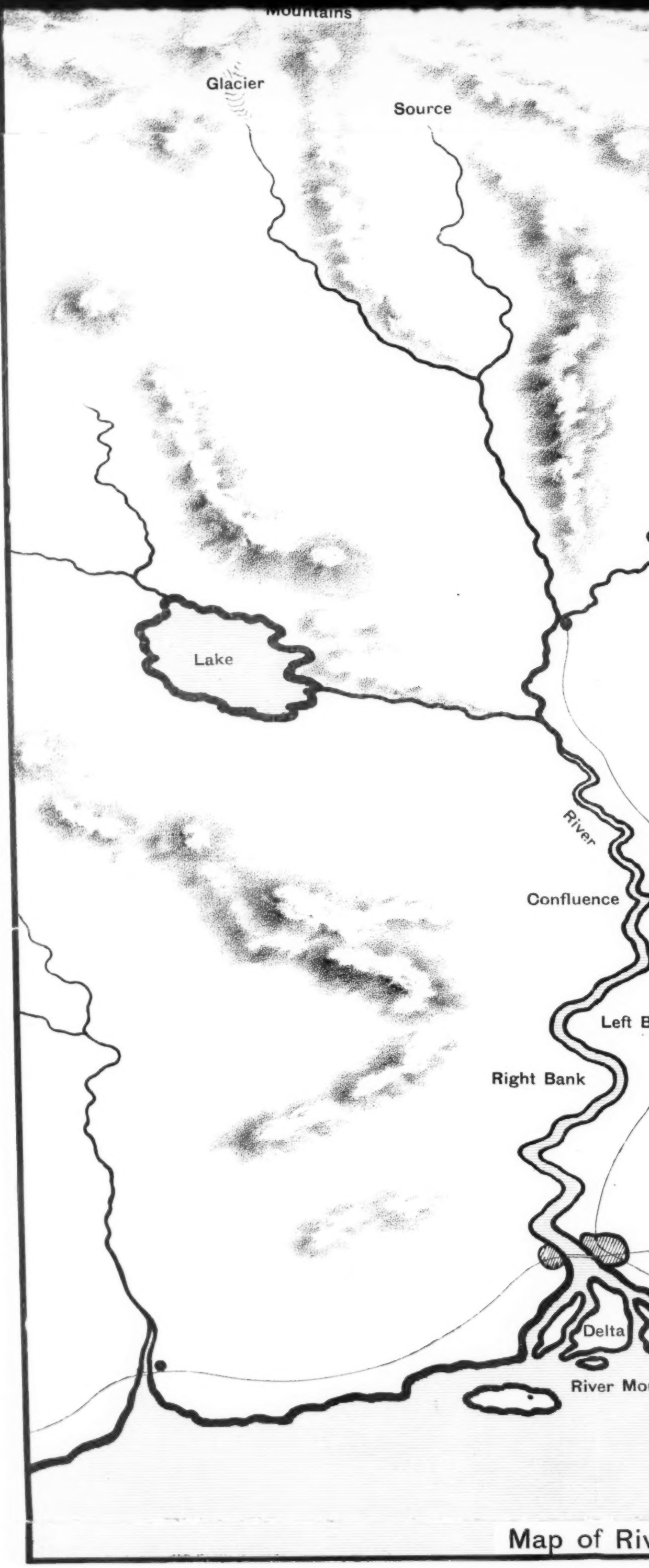

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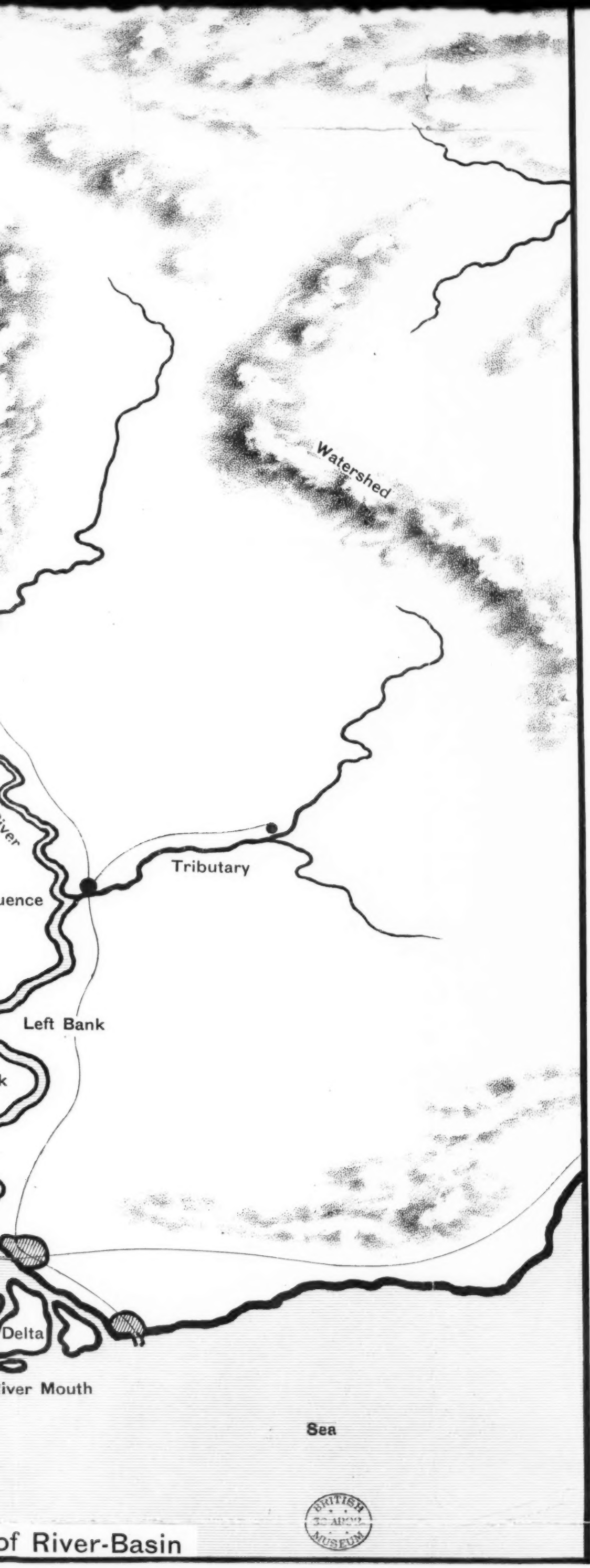

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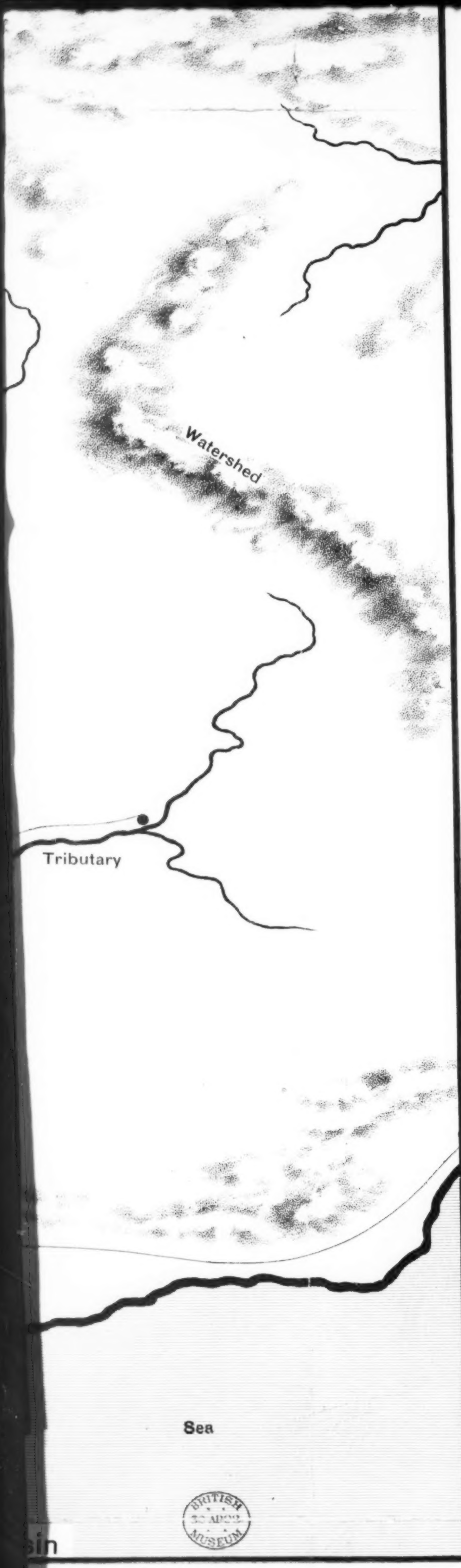

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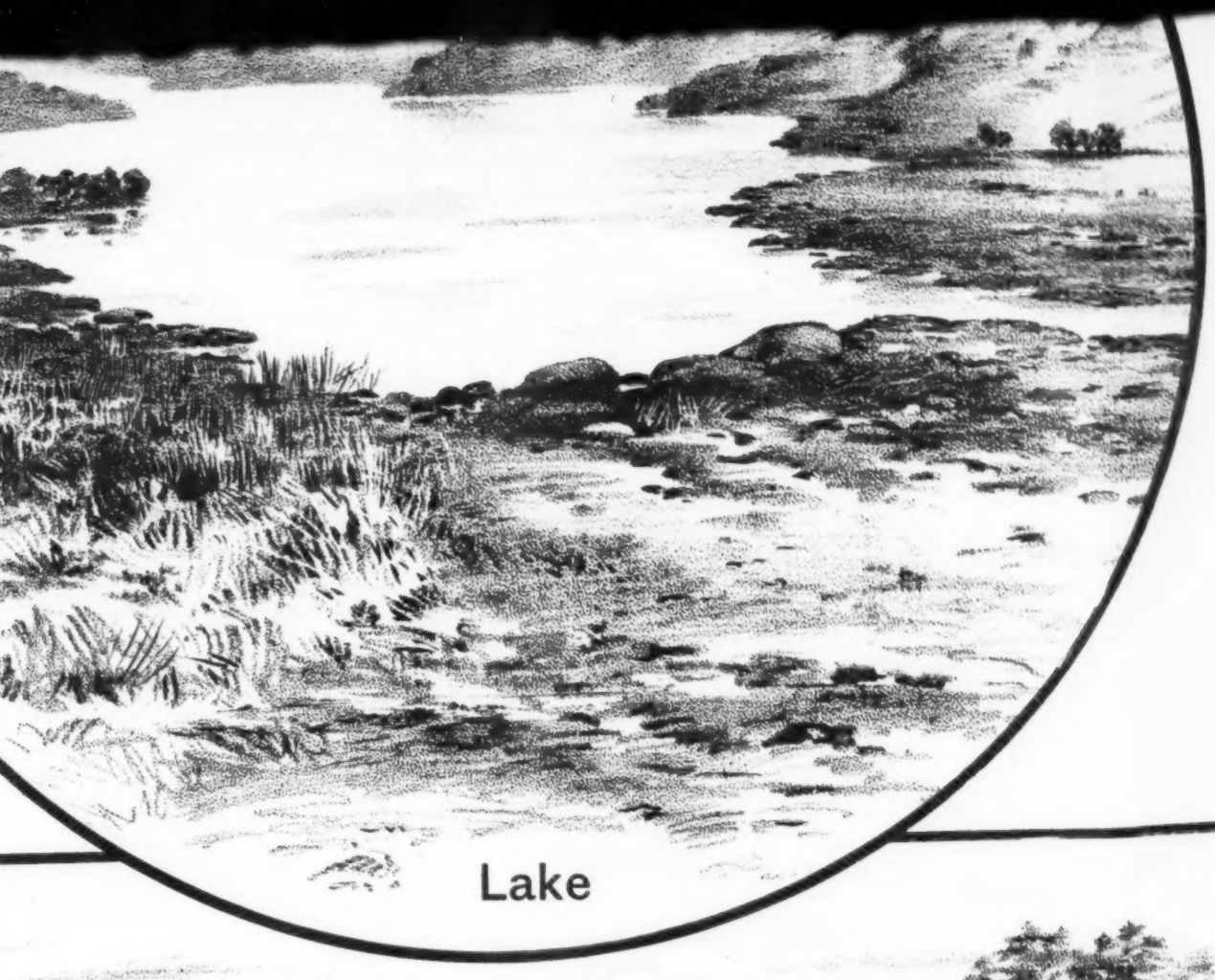

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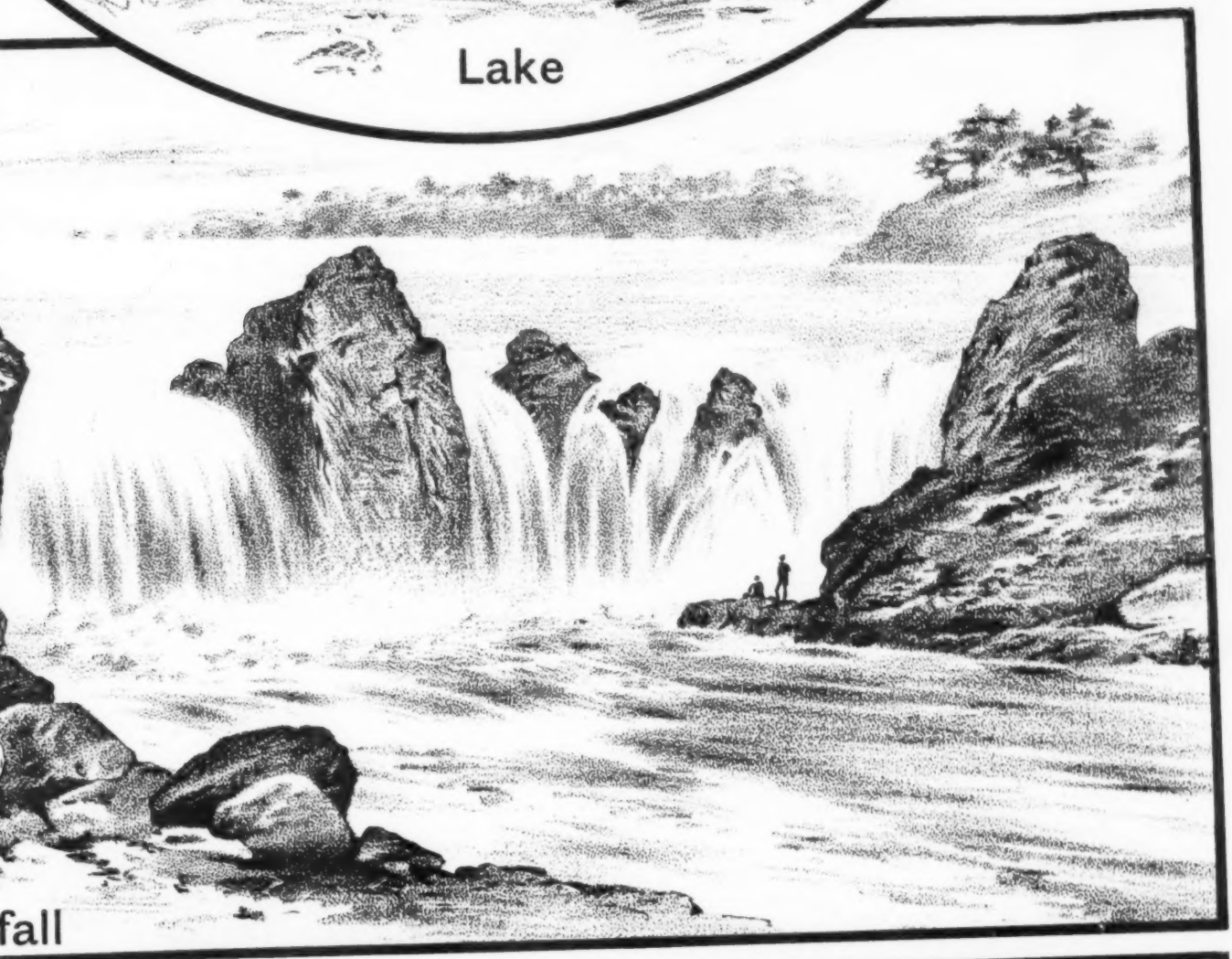

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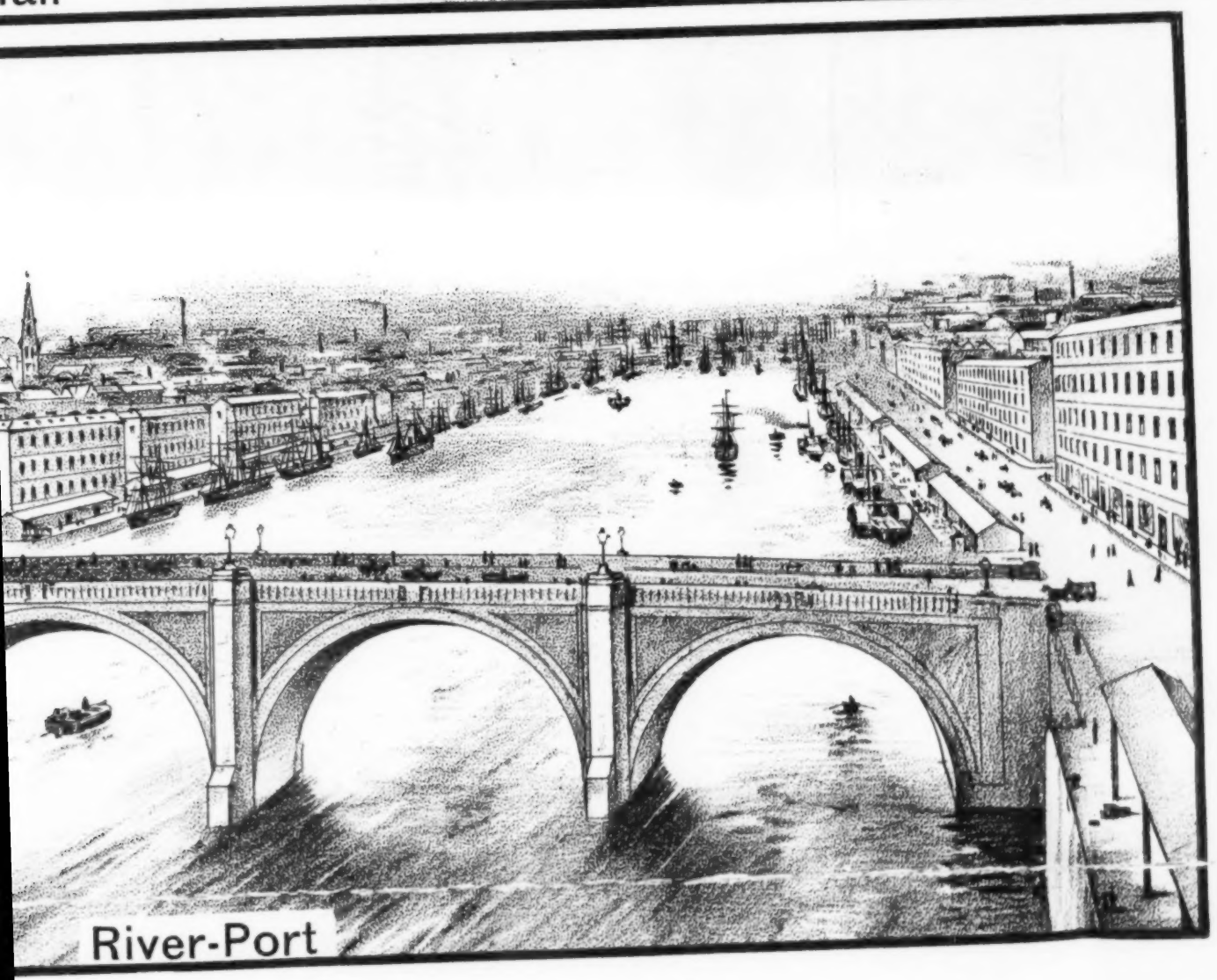

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